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#### LORD SELBORNE'S FOOD SUPPLY MEETING.

THE following address was given by THE PRESIDENT OF THE BOARD OF AGRICULTURE AND FISHERIES (THE RIGHT HONOURABLE EARL OF SELBORNE, K.G., G.C.M.G.) at a meeting with farmers and agricultural associations to consider the steps to be taken to maintain, and, if possible, increase the production of food in England and Wales, held at the House of Lords on Thursday, 26th August, 1915, at 3 p.m.

LORD SELBORNE said: My Lords and Gentlemen: I have asked you to come here to-day to hear what I have to say about the position in which agriculture in England and Wales will find itself in the coming year, which commences after this harvest. But before I speak on that subject, I think you would wish me to say something about the state of the war, and indeed it is necessary that I should do so, because it is the war conditions under which we are living which will be the governing conditions for all our farmers in the coming year.

You will have read recently a remarkable summary of the naval position, put forward by Mr. Balfour. It amounts to this, that at sea we have achieved a complete triumph, and a final triumph, if the German fleet is not prepared to come out and fling down the gage of battle. (Hear, hear.)

In all the minor land operations of the war we have been successful, except in East Africa, where we had a severe rebuff last November, and where neither side has been able since to achieve an advantage over the other. I call them minor operations only in comparison with the great operations going on in Europe, because the operations in Mesopotamia have been as important as successful; and General Botha's triumph

in German South-West Africa has been a most remarkable achievement. (Cheers.)

Now, in Europe, we are engaged in warfare in two fields. At the Dardanelles, the physical features of the Gallipoli Peninsula present the most formidable difficulties to our Army, and it has not yet been able to secure those positions which would enable it to dominate the situation. I believe that the German officers who control the Turkish army thought it impossible for our troops to effect a landing on the Peninsula at all, and the fact that they did so, both at Cape Hellas and at the Anzac Cove enables you to take some measure of their heroism and indomitable spirit. (Hear, hear.) The presence of our Army in the Peninsula has attracted to it troops from all over the Ottoman Dominions, and so we have been able to render a real service to Russia by reducing the Turkish forces which otherwise would be confronting the Russian army in the Caucasus.

Then I pass to the Western field of warfare. I need not remind you on this occasion of the historic heroism of Belgium—(hear, hear)—and I am sure you all feel, as all our men at the front feel, that no tribute can be too great to the dauntless spirit of France and to the unmatched bravery and efficiency of the French army. (Hear, hear.) But neither side has been able now for many months past to achieve a decisive success over the other. You know the causes of that delay—I need not dilate on them to-day—I can only say that immense vigour is now being shown in endeavouring to repair the omissions of the past.

And now we pass to the German successes in the East of Europe. Those successes, Gentlemen, are the successes of an efficient military organisation, not the successes of the German soldier over the Russian soldier. The Russian soldier has been absolutely sublime—(hear, hear)—under circumstances more trying to an army than, I should think, ever occurred in the history of modern warfare. You know the causes of the Russian retreat; the same causes that are responsible for our position in the West. It is not for us to make any criticism on Russia; nor is it wonderful, really, that the Germans should have achieved so great a triumph in this matter of organisation. We know their national characteristics of thorough work and preliminary study, but it was said long ago that the national industry of Prussia is war, and we must remember that Germany has been preparing for this war for years past—(hear, hear)—that she alone willed war when all the rest of the nations of

Europe urgently longed for peace—(hear, hear)—and that she made war at the moment chosen by her.

It is not unnatural, however, that the Germans should feel elated. They have achieved nearly half as great a success by land as we have by sea. But, Gentlemen, we have supreme confidence in all our Allies, and in our own people. (Hear, hear.) It is true that there have been omissions in the past for which we are paying dearly, but it is also true that we have redeemed all our pledges ten-fold. But I cannot conceal from you that we are still faced by a long and grim struggle. (Hear, hear.) You must remember that the set-back of Russia imposes a greater burden upon the Western Powers and so upon Great Britain; we have a greater burden on our shoulders at the present moment than we had six months ago.

Now, Gentlemen, how are our people equipped for this grim and terrible struggle? I believe that no people has ever existed which, by its temperament, was more fitted to endure and to win through. You know the heroism of our seamen and of our soldiers, but I want you also to think of the heroism and self-sacrifice of the women of England, and of the working-men of England. (Hear, hear.) The attitude of the women has been nothing but an inspiration to the men—absolute self-sacrifice, perfect calm determination to win through in this cause on which the whole future of their children and their grandchildren depends.

But what about the working-men? You read of the failures, and you discuss the failures; you read of a strike, and you condemn it; you are quite unable to understand how, at such a time as this, insistence should be laid on Trade Union rules. Gentlemen, among Trade Unionists and other working-men there are selfish and unpatriotic men, just as there are in any other class of the community, but the great majority of these labour troubles do not arise from selfishness, they arise from want of the power of imagination, from inability to understand how the action of a trade section in a particular works may affect the fortunes of this great war. But I want you not to think of the failures, but to think of the successes. You read of the failures; you read of the trouble; but you read nothing of what the millions of working-men who do not fail have been doing, and are doing. (Hear, hear.) It was only in an American paper that I happened to read the account of an ammunition factory almost entirely manned by women. One woman had worked consecutively for thirty hours, and so great was the strain in that factory that the women thought



nothing of the hours they worked. But when the day came that they had achieved a certain output of munitions, they decorated the whole factory and all their machines with flags.

Have you thought of what the railwaymen are doing? An immense number of men have been taken from the railways. The railways are carrying now a volume of trade such as never has been carried on our railways before, and the strain on those men is very great. That is nothing but silent heroism; as necessary and as great a contribution to victory as the work of the seaman or the work of the soldier.

And think of the men in the dockyards, and many other factories, who have been working seven days a week and overtime, and who fall to sleep whenever they knock off work. All that is not chronicled in the newspapers, but all that is going on, and it shows you how splendid is the temper of the country, and that you are not to judge only by those occasional troubles of which you read. (Hear, hear.) But, Gentlemen, should it not be so, for what is the stake? It is not only the existence of our Empire, or the existence of the trade by which our people live, but all our national ideals are at stake. A nation is composed of the aggregation of ideals. We all wish for a better and a happier England. One man may think that the happiness of England depends on the work of the Church, or on religious education; another may think that it really depends on the maintenance of Trade Union principles; and between those two ideals there is every possible variety of ideals; but the reason why we are united is because our ideals are all, at one and the same time, at stake in this war. Democracy itself is on trial, and all the institutions which derive their spirit from democracy are on trial. Liberty is fighting for its existence against a dominant military caste; the question at issue is whether brute force, which owns no moral law, is, or is not to be, enthroned in Europe. Those are the questions for which we are fighting, and no man, no set of men, in the whole country have their personal ideals more at stake than the Trade Unionists. I would almost put it thus—the struggle is between the British Trade Unions and the super-capitalist, Krupp, and whether the Trade Unions win or lose depends entirely upon themselves.

It is quite right that we should face squarely our own shortcomings, difficulties, dangers, and disappointments, but if we want really to understand the position we should also try and put ourselves in the place of our enemies. From the very commencement they desired that this should be a short

war ; first of all it was to be a six weeks' war, then a six months' war, and now they want to end the war before the winter. They dread a prolonged war ; they dread a test of endurance, and you may be sure that the sun of present victory does not really blind their eyes to the cloud of doom which looms over them in the coming year. (Hear, hear.)

I have dwelt on all this because I want to lead up to this point. The situation in which we find ourselves is going to demand from us, from every class of our community, a greater and a greater sacrifice. The financial strain on us is going to be very great indeed—(hear, hear)—and there is going to be a demand for many more men for the Army. I do not care what the system is in this respect—whether it be voluntary, or whether it be compulsory—many more men have got to go to the Army, and from agriculture among other industries.

The agricultural labourer has done his part nobly in this war. (Hear, hear.) Do not let us forget that that is no new experience for him ; he has played his part in all our past wars, and in time of peace it is no exaggeration to say that a proportion of the defence of the country out of all comparison to their numbers has fallen on the agricultural labourers, especially on those drawn from the west, the south, and the east of England, both for service in the Navy and service in the Army. In this war, as I have said, the agricultural labourers have played their part nobly, but the response has been very unequal over the country. In some districts, villages and farms have been practically denuded of their young men ; but in others, hardly any men have gone ; and, therefore, what I forecast is going to happen in this next farming year is this—that men will be taken, and will have to go, from those districts and from those farms whence they have not hitherto gone. I hope that those farms which have nearly been denuded will not be further denuded. (Hear, hear.) At any rate, I have done, and shall do, my best to take care that no one in what I would call the most skilled class of agricultural labour is taken. (Hear, hear.) What I shall aim at is this—and Lord Kitchener has been very sympathetic whenever I have approached him on the subject—to leave you your foremen, your stockmen, your carters and your shepherds. (Hear, hear.) But, if those are left you, in many and many a place, the rest of the work will have to be done by women, or by men who have not hitherto been engaged in agriculture.

Now, those are the conditions, the war conditions, which will

govern the farmer's work in the coming year, and all that I have now to say about the work of the agricultural community in the year just commencing will be governed by those conditions.

Soon after the war broke out, my predecessor appointed an Agricultural Consultative Committee, of which Sir Ailwyn Fellowes is the Chairman. That committee is a very strong one. It has been summoned from time to time to advise the Board of Agriculture on any particular question on which advice was required for the moment. For instance, when I have had to deal with these Live Stock Orders, on both occasions I have consulted that committee, and I am glad to take this opportunity of expressing the gratitude of my predecessor and myself for the great services which that committee has rendered.

But I thought that something more was required, and that it was advisable to appoint a Committee, with a special reference—how the food production of the country could be maintained, and, if possible, increased during the war. That is not a committee which will sit permanently during the war, like Sir Ailwyn Fellowes' committee, but which will make its report and then be dissolved. Lord Milner accepted the chairmanship of that committee, and again I think I may claim that its membership was as representative and as strong as it could be made. That committee has not yet sent in its final report, but, in July, it sent in an Interim Report, which will shortly be published.

Now, I am going to tell you what were the recommendations in that report. It was exclusively concerned with the question of wheat growing, and in this report—subject to a governing paragraph which stated that the Government, and the Government alone, could say whether, on a given occasion, a given measure was advisable—subject to that condition it recommended that the farmers be offered a 45s. a quarter guarantee on wheat for four years commencing after next harvest, that is to say the guarantee would begin to run after the harvest of 1916 and would run till the harvest of 1920. That recommendation was accompanied by a careful estimate, set forth on the highest authority, of what the effect of such a guarantee might be supposed to be. It made recommendations for a machinery to set the guarantee in working order and to ensure that the conditions laid down in respect of the guarantee should be fulfilled. The report also dealt with such important questions as restrictive covenants and the rate of the wages of

the agricultural labourer. Now, those recommendations can only be considered in what I would call their war aspect. If those recommendations had been made before the war, they would have evoked great party controversy, and we should all have had our own opinion about them; and the same will be true, though in a wholly different sense, after the war. I have no hesitation in expressing my personal opinion that, after the war, the whole of the question of our agricultural and economic policy and of food production at home will have to be revised—(hear, hear)—in the light of our experience of submarine warfare. At present, the Navy have the submarine menace well in hand, in that there is no reason so far to fear that the Germans will be able to effect a complete interruption of our sea communications during the course of this war, though periodically they may be seriously disturbed. They were very disturbed last week; they may be more disturbed in the future. But, after the war, we have got to consider what the developments of submarine navigation and submarine construction may be, and unless some naval answer to the submarine is forthcoming, which has not yet been forthcoming, I again express my personal opinion that we shall have to revise and review our agricultural and economic position in the light of our experience.

But the question is no more of the future than it is of the past. The question is simply and solely a war question:—Is this or is this not a wise guarantee to give at the present time, in view of the great importance of increasing our home production of all sorts, but not least of food, in view of the financial position, in view of the drain of men for the Army, and of other matters.

After this report had been received I need not say that the Admiralty were consulted, and that all through the Government have acted in consultation with them, and what is of great importance as bearing on this question was fresh information which reached them after that report had been received, and before it had been considered. Shortly after it had been received, the Agricultural Returns of 1915 came to hand, first of all 75 per cent. of them, then 90 per cent. of them, and the final figures I hope will be ready for publication in a few days. In addition to that we had the final reports on the Canadian and Australian harvests. The figures I am going to give you about the Agricultural Returns are for the year 1915, compared with the year 1913. I take 1913, because that, you will find in the Interim Report of Lord Milner's committee, was the year taken by them as the standard for

comparison. The figures of increase would not be so great if the comparison were with the year 1914, because the upward tendency had already then commenced, but as compared with the year 1913 there are at the present moment 500,000 more acres of wheat under cultivation, or an increase of nearly 30 per cent. The increase in cattle is 384,000, and the increase in sheep 450,000. There is very little importance to be attached to the figures of the increase of sheep, because, as you know, we reached a very low point two or three years ago, and this is only a partial recovery, but the figures for cattle constitute an absolute record. In view of these remarkable figures disclosed by the Agricultural Returns; in view of the fact that it was borne in upon us as the history of the struggle in the East of Europe developed that the call on men, on agricultural labourers, for the colours would be very heavy in the coming year; in view of the difficulties with which the farmer would thereby be confronted; in view of the superabundant harvest in Canada and Australia, and in view of the great financial stringency which will certainly prevail after the war, the Government decided that they would not incur the additional financial liability involved in the guarantee.

I know that that decision will disappoint many of my agricultural friends. I am quite prepared for, and shall make no complaint of, criticism. I only have this one observation to make, and that is, that, in taking our decisions of war policy from day to day, we have to balance against each other a great number of complicated considerations that are often conflicting, and all that can be done is to take that decision to which the balance of argument seems to incline.

I have stated the grounds on which this decision has been arrived at, and if you want to criticise it fairly you must consider all that I have put before you—the increase in wheat acreage and in the number of cattle, the great drain that is going to be made on the manhood of the country, the great financial stringency which will prevail after the war—and balance those, as we did, against the manifest and clear advantage otherwise of doing all we could to stimulate the production of wheat in the country.

I am very grateful to Lord Milner's Committee. If it had not been for the Interim Report of that Committee we should not have had the material on which to form a reasoned judgment. I know that immense labour and pains were taken with this Report, but I hope the Committee will not cease its labours because, for the reasons I have given, we came to

the conclusion that we could not adopt that particular recommendation. In carrying out the efforts I am now going to describe, their advice and assistance will be of great value, for the farmers will require all the assistance which the Board of Agriculture can give them to overcome their difficulties in the coming year; and not only the farmers, but all that part of the agricultural community which lives in villages and country towns and whose aggregated labour and effort may make such a large contribution to our total national production, if well directed, assisted and advised.

Again, I venture to say this to the farmer, that we shall have to help each other during the coming year more than ever has been necessary in past years with our machinery, and with our labour.

Now, how do I see the situation? I see that the farmer is going to have great difficulties about labour; and the farmer is not very ready, as a rule, to turn to new sources of labour. There has been a great number of women willing to volunteer their services, but very few farmers have availed themselves of their services. There has been a considerable amount of volunteer labour offered, but again, many farmers have not availed themselves of those volunteers. I think I shall be able to show from the example of farmers who have used women unskilled volunteer labour during the past few weeks that a great deal can be done through such means under the direction of the farmer himself.

Then again, the farmer has not been accustomed to make use of the Labour Exchange. The Labour Exchange has been outside his sphere of operations, and although the Labour Exchange has been very anxious to help him there has been no customary contact between the Labour Exchange and the farmer. Again, Lord Kitchener, under certain restrictions, was willing to put military labour at the disposal of the farmer, and that military labour has been used to a very considerable extent, though in varying degrees, in different parts of the country. I do not think anything like as much use has been made of that labour as might have been, nor was there any machinery, before the matter was settled by the War Office—and to this point I will come presently—to enable the farmers to offer their criticism of the conditions under which the War Office was prepared to lend the services of the soldier. Therefore, while the farmer will have great difficulty in the matter of labour, there are various sources from which labour can be drawn. The question is, can the farmer use that labour to his advantage and will he do so?

Then, again, there is the matter of requisitions. The War Office buyers come to the farmer and demand his hay at a certain price. We have taken all the precautions we could to give the farmer an opportunity of appeal. I think the machinery for that appeal is adequate; it was published in all the newspapers; but a large number of farmers have remained in complete ignorance of the remedy which lay to their hands, and they have suffered in silence at the time, nursed their grievance, and complained when too late. Again, in the coming year the farmers may have difficulties in the matter of supply, machinery, feeding-stuffs and fertilisers. I cannot foresee to what extent those things may present difficulties to them, but, in my judgment, in many cases there will be difficulty. Again, from time to time, the Board of Agriculture will issue Live Stock Orders. It is very difficult for the Board of Agriculture to ascertain where the shoe pinches. You may get one group of farmers protesting and stating their case reasonably and fully, and showing where they want amendment, but if you get no kind of guidance from the rest of the country it is very difficult to tell how far the case of those farmers is isolated and how far the remainder of the agricultural community is in agreement with them.

The Board of Agriculture has been assisted not only by great permanent agricultural bodies like the Royal Agricultural Society, the Associated Chambers of Agriculture and others, but also by local committees which have been established in various counties to deal with one aspect or other of the agricultural problem, and I am grateful indeed to those bodies and to those committees for the assistance they have given us in the past year, as I am also to the Labour Exchanges for doing their best to help us, though, as I have said, there was not any real contact between them and the farming community.

But what I have felt is that there is need for much better co-ordination and organisation. Here you have in London the Board of Agriculture and Fisheries, which may be able to give considerable assistance, and is anxious to devote the whole of its services to the farming community in the coming year, but which has no machinery to get into contact with the individual farmer; and such bodies as I have described have either not been constituted for the purpose of acting as the link between the Board of Agriculture and the farmers, or, if they have so been constituted they have no staff to act in any sense in an executive manner.

Therefore I propose to adopt a valuable recommendation,

made in the Interim Report of Lord Milner's Committee, that the county council should be asked to act as the link between the Board of Agriculture and the farmer. I have not yet had the opportunity of meeting the representatives of the county councils, I hope to do so shortly, and, therefore, I have no right to speak for them, but I have very little doubt that they will do all that they possibly can to help the farmers in this emergency. (Hear, hear.) What I am going to ask them to do is to establish in each county a sub-committee, or one of their committees, if there is such a committee adapted for the purpose, to deal with the whole county, and then to appoint in the smaller areas of the county committees which will be in continuous correspondence with it. It will be for them to decide whether they would take a rural district council unit or a petty sessional divisional unit or some other unit, but I care not what it is so long as they are able to cover the whole county and to get into communication with all the farmers of the county.

When I meet the representatives of the county councils I will try and work out the details with them; therefore, all I am doing now is to give you the most general possible sketch of the machinery which I propose to adopt. I know very well from my own experience that the county councils are over-worked bodies—(hear, hear)—and that under ordinary circumstances they would be extremely loth to take upon themselves any fresh duty, but I would submit to them that the present occasion is exceptional. What I ask them to do is a patriotic duty, and there is really no other body in existence which can fill the gap. The Treasury are prepared to grant a subvention towards any expenditure to which they may be put. I do not think that the expenditure for machinery ought to be a large one. There will be a certain amount of clerical labour, printing, stationery, travelling expenses and so forth, but, as we all know, all the main part of the work will be done by voluntary labour by people who live in the county, and the actual expenditure on machinery ought not to be large.

Now how do I think that such a body would be able to work? The Board of Agriculture will for the first time be in contact with the individual farmer. The individual farmer will have a local body, not a distant body but a local body, composed of people who are his personal friends and neighbours, to which he can go with his difficulties, be they about labour, be they about military requisitions, be they about Live Stock Orders, or be they about his supplies of machinery, fertilisers and feeding-stuffs. The



county councils will advise and direct the smaller committee. The county council will be able to focus the difficulties of the farmers, to classify them, very often by advice and assistance to remove them, and where they cannot do so then they can come to the Board of Agriculture. The Board of Agriculture will have a definite responsible body to deal with in each county, instead of vainly and fruitlessly endeavouring to correspond with the individual farmer. And the officers of the Board of Agriculture, few in number and very hard-working and efficient, who are scattered throughout the country, will, of course, do all they possibly can to act also as links between the different farming communities and the county council and the Board of Agriculture.

It may be—I cannot foresee—that, as we gain experience through the county councils, there will be certain clear indications of where the Government can give material assistance to the farmers in their difficulties. All I can say about that is this: if a case is made out I shall do my best to press it. I can make no promise about financial assistance, much as I may desire it, because, as you will see, everything must be governed in this war by the financial stringency which is going to bear down upon us in the form of taxation. The first claim upon the Exchequer must be for the Army and for the Navy. (Hear, hear.)

Now, Gentlemen, I have nearly done. I have not concealed from you that I think the position of the farmer in the coming year is going to be a very difficult one. I thought it much better to tell the farmer frankly what was going to be the call on the agricultural labourers, and not to conceal it from him. (Hear, hear.)

Gentlemen, I think the record of the farmers in the year that is now closing has been a very fine one. The difficulties will be greater in the coming year, but they have been great enough in this year, and that in this year the farmers have been able to add 500,000 acres of wheat-land and to keep their stocks up to the pitch which I have described is, I think, a wonderful record.

But there are rivals to the British farmer. If you talk to people who have paid a visit to the fighting line in Flanders and France, I am quite sure every single one of them will tell you the thing that has struck him most has been the state of the cultivation of the land right up to and within the zone of fire—(hear, hear)—a cultivation which has never been surpassed in the history of France or Belgium, a cultivation

carried on by old men, by women and by children. When I was there I never saw an able-bodied man in the fields.

Now, surely what has been done in France and Belgium can be done in England and Wales. Even with these unforeseen difficulties, with these increasing difficulties, I appeal to the farmer to do even better in the coming year than he has done in the past year.

When the history of this war is written, let us look back with amazement on the fact that in the year of absolutely unparalleled difficulty the British farmer not only maintained, but increased his production of food.

But you must be willing to welcome the assistance of those whose assistance you have not been accustomed to use. After all, it is better to get in the harvest with unskilled labour than not to get it in at all—(laughter)—and if we all endeavour to help each other, to utilise all the sources of assistance which our ingenuity can find, I believe that the task which I have asked you to perform can be performed. All I can say is, the whole services of the Board of Agriculture and Fisheries and of the skilled and zealous staff over which I have the honour to preside will be at your disposal. (Cheers.)

Captain CHARLES BATHURST, M.P., Chairman of the Central Chamber of Agriculture, then replied to Lord Selborne's speech :

In joining with the PRESIDENT in expressing the greatest admiration of the magnificent pluck and patriotism of fellow agriculturists in France and Belgium, he said he was deeply conscious that, if agricultural operations could be carried on under such difficult circumstances as face them, it is the duty of English farmers to conduct their agricultural processes with the greatest amount of courage, with the greatest possible amount of patriotism, and, if necessary, at the cost of considerable personal self-sacrifice. (Hear, hear.) In referring to the shortage of labour he said that it was impossible altogether to replace skilled labour by such forms of labour as those to which the PRESIDENT alluded, and he made a special appeal to the PRESIDENT to allow the retention on the farms, if possible, of the carters, stock-men, thatchers, engine drivers, blacksmiths, and those who have skilled knowledge in the process of steam cultivation. He pleaded that it had not come clearly to the consciousness of the skilled farm hands that they were, in their present position, doing the maximum possible amount of patriotic work that could fall to their lot, and he asked the Government to make it clear to these men that they were doing their country's work more

competently in the position they now occupied than they would be likely to do in some other capacity. He pointed out that if the PRESIDENT's appeal was to be regarded as one for a great extension of arable cultivation, involving the ploughing up of a large acreage of second-rate pasture, it would undoubtedly involve risking a large additional amount of capital which might conceivably be lost, and many agriculturists would undoubtedly have supported the report of Lord Milner's Committee in asking that they might be secured against the possible loss of this additional capital consequent upon the conversion of so-called grass land, which involves a comparatively small amount of capital to farm, into arable land, which involves a much larger outlay.

Continuing, however, Captain BATHURST stated that he pressed none of the foregoing points on the PRESIDENT's attention; as a definite reply could not be given to the PRESIDENT's proposals; before giving a final answer it was desirable to consult the members of all the leading agricultural organisations of the country. But what he did want to tell Lord SELBORNE was that any proposals he made now or hereafter to agriculturists would not only receive their utmost possible sympathy, but whatever be the risks, whatever be the personal self-sacrifice, according to their resources—which were none too large in many cases—and according to their opportunities, they would do their utmost to support the PRESIDENT and the Government in this matter. (Hear, hear.)

In conclusion, Captain BATHURST pointed out that unless the county councils were given very full powers in acting as agents for the Board of Agriculture it might be a little difficult for them to afford speedily and effectually that assistance which the PRESIDENT stated would be forthcoming for the promotion of agricultural processes, and to carry out what agriculturists would deem to be their national duty in a year which is bound to be full of difficulties to the agricultural population. He desired absolutely to repudiate any suggestion made with regard to the selfishness of the agricultural community, or as to any inclination whatever on their part to make money at the expense of the public at a time of national crisis; and he emphasised the point that there were no more patriotic men in this country upon whom the Government were entitled to depend than the British farmers. (Cheers.)

Lord NORTHBROOK, on behalf of the representatives of agricultural societies and other bodies, in moving a vote of thanks, again assured the PRESIDENT that the farmers of this country would consider the proposals in a patriotic spirit;

they would not look on them from the point of view of their pockets or profits, but of how they could support the Government and help the country in the present great crisis.

The vote of thanks was seconded by Mr. COLIN CAMPBELL, representing the National Farmers' Union, who followed the two previous speakers in stating that the farmers would help the Government loyally in every way they could.

The resolution was put to the meeting by Captain BATHURST and carried unanimously.

The PRESIDENT then replied as follows: Captain Bathurst, Lord Northbrook, Mr. Colin Campbell and Gentlemen, I am greatly obliged to you for coming here to-day, and for what has been said, and for your vote of thanks. I am not going to make another speech. I do wish, however, to make three sets of observations in answer to what has been said, and I should be glad if the Press would be good enough to take them down, because I think they have their importance.

The first is that it is absolutely true that the agricultural community is second to none in England and Wales in patriotism. It is not true that the farmers have tried to exploit the war to their advantage (hear, hear) because the prices which rule are not prices fixed by them, but world prices. (Hear, hear.)

The second observation I wish to make is this—and it is made to every individual farmer in the country—the circumstances of no two farms or farmers are the same. I know the conditions vary everywhere. I have told you exactly and frankly the public conditions under which you will have to work in the coming year, and I appeal to you, not as a philanthropist, but as a man of business who is also a patriot. Each man can settle for himself how he can blend these two qualifications into the greatest service both to himself and to the State.

The third observation I wish to make is this, and if the Press will be good enough to report it, you can have it printed and circulated. I say to the highest skilled men in agriculture, the foremen, the stock-men, the carters, the shepherds, the engine drivers, the thatchers and the blacksmiths, if you leave your present post to go into the Army or Navy, or into a munition factory, your motives may be good, but your judgment is wholly bad --(cheers)--you can perform a greater service to England to-day by staying where you are than by going anywhere else.

*The Meeting then terminated.*

## FARMING AND FOOD SUPPLIES IN TIME OF WAR.

R. H. REW, C.B.,

*Assistant-Secretary to the Board of Agriculture and Fisheries.*

THE following was Mr. Rew's Presidential Address to the Agricultural Section of the British Association, at the meeting held at Manchester from 7th-11th September, 1915 :—

Agriculture is the antithesis of warfare ; farming is pre-eminently a peaceful avocation, and farmers are essentially men of peace. The husbandman is not easily disturbed by war's alarms, and his intimate association with the placid and inevitable processes of Nature engenders a calmness of spirit which is unshaken by catastrophe. Many stories illustrative of this attitude of mind come to us from the battle-fields. The complete detachment of the fighting men from the rest of the community which was usual up to quite recent times is impossible in these days when, in almost every country, the army is not a class but the nation. It is inconceivable now that a war could rage of which it could be said, as has been said of our Civil War : " Excepting those who were directly engaged in the struggle, men seemed to follow their ordinary business and their accustomed pursuits. The story that a crowd of country gentlemen followed the hounds across Marston Moor, between the two armies drawn up in hostile array, may not be true ; but it illustrates the temper of a large proportion of the inhabitants."\* But while farmers and peasants within the range of the guns cannot now ignore the fighting, they have repeatedly demonstrated their invincible determination that the madness of mankind shall not interrupt the calm sanity of the ordered cultivation of the soil. Of a district in the Argonne, a correspondent, writing in April last, said : " The spring seed has already been sown or is being sown, sometimes indifferently, under shell-fire, right up to the edge of the trenches."† A story was told of a farmer in Flanders looking over the parapet of a trench and demanding of an indignant British officer whether any of his men had stolen his pig. On receiving a suitable reply he observed that he had already asked the French, who also denied all knowledge of the missing animal, so that he supposed it must be those condemned Germans whom he forthwith proceeded to inter-

\* Prothero : "English Farming, Past and Present," p. 104.

† *Westminster Gazette*, 30th April, 1915.

view. Such a sublime sense of values, such absorption in the things that matter, such contempt for the senseless proceedings of warfare are only possible to the agriculturist. The quarrels of mankind are transient, the processes of Nature are eternal. One thinks of Matthew Arnold's lines—

*The East bow'd low before the blast  
In patient, deep disdain,  
She let the legions thunder past  
And plunged in thought again.*

But while the farmer is, by instinct, a pacifist, he is also, in a cause which rouses him, a doughty fighter. In that same Civil War, to which so many were indifferent, the farmers of East Anglia, under Cromwell, changed the course of English history; and the thoroughness with which they turned their ploughshares into swords is demonstrated by the fact that when they took to soldiering they put the nation, for the first and only time, under what is now termed militarism, that is, government controlled by the army. In the last battle fought on English soil the yeomen and peasants of the West country proved, amid the butchery of Sedgemoor, that bucolic lethargy can be roused to desperate courage. Indeed, through all our island story, since the English yeomen first broke the power of mediæval chivalry and established the supremacy of infantry in modern warfare, it has been from the rural districts that the nation has drawn its military strength. Even in the present war, when the armies of the Empire have been drawn from all classes of the community, the old county regiments and the yeomanry squadrons with their roots in the countryside have proved once more that the peaceful rustic is as undismayed on the field of battle as on the fields of peace.

It is, however, in his pacific rather than in his belligerent aspect that the British farmer now claims our attention; and before considering the position of farming in the present war we may briefly glance at its position when, a century ago, the nation was similarly engaged in a vital struggle.

From February, 1793 until 1815, with two brief intervals, we were at war, and the conflict embraced not only practically all Europe but America as well. The latter half of the 18th century had witnessed a revolution of British agriculture. The work of Jethro Tull, "Turnip" Townshend, Robert Bakewell, and their disciples, had established the principles of modern farming. Coke, of Holkham, had begun his missionary work; Arthur Young was preaching the gospel of progress; and in 1803 Humphrey Davy delivered his epoch-making

lectures on agricultural chemistry. Common-field cultivation, with all its hindrances to progress, was rapidly being extinguished, accelerated by the General Inclosure Act of 1801. A general idea of the state of agriculture may be obtained from the estimates made by W. T. Comber of the area in England and Wales under different crops in 1808. There were then no official returns, which indeed were not started until 1866; but these estimates have been generally accepted as approximately accurate, and are, at any rate, the nearest approach we have to definite information.

I give, for comparison, the figures from the agricultural returns of 1914 which approximately correspond to those of the earlier date:—

	1808.	1914.
	<i>Acres.</i>	<i>Acres.</i>
Wheat .. .. .	3,160,000	1,807,498
Barley and rye .. .. .	861,000	1,558,670
Oats and beans .. .. .	2,872,000	2,223,642
Clover, rye-grass, etc. .. .. .	1,119,000	2,558,735
Roots and cabbages cultivated by the plough .. .. .	1,150,000	2,077,187
Fallow .. .. .	2,297,000	340,737
Hop grounds .. .. .	36,000	36,661
Land depastured by cattle .. .. .	17,479,000	16,115,750

The returns in 1914 comprise a larger variety of crops than were cultivated in 1808. Potatoes, for instance, were then only just beginning to be grown as a field crop, and I have included them, together with kohl-rabi and rape, among "roots and cabbages."

The population of England and Wales in 1801 was 8,892,536, so that there were  $35\frac{1}{2}$  acres under wheat for every 100 inhabitants. In 1914 the population was 37,302,983, and for every 100 inhabitants there were 5 acres under wheat.

The yield of wheat during the 20 years ending 1795 was estimated at 3 qr. per acre;\* in 1914 it was 4 qr. per acre. The quantity of home-grown wheat per head of population was, therefore,  $8\frac{1}{2}$  bush. in 1808, and  $1\frac{1}{2}$  bush. in 1914. Nevertheless, even at that time the country was not self-supporting in breadstuffs. In 1810 1,305,000 qr. of wheat and 473,000 cwt. of flour were imported. The average annual imports of wheat, from 1801 to 1810, were 601,000 qr., and from 1811 to 1820 458,000 qr. Up to the last decade of the 18th century England

\* Report of Select Committee on the means of promoting the cultivation and improvement of the waste, unclosed and unproductive lands of the Kingdom, 1795.

was an exporting rather than an importing country, and bounties on exports were offered when prices were low, from 1689 to 1814, though none were in fact paid after 1792.

During the war period we are considering, the annual average price of wheat ranged from 49s. 3d. per qr. in 1793 to 126s. 6d. per qr. in 1812, the real price in the latter year, owing to the depreciation of the currency, being not more than 100s. In 1814 the nominal price was 74s. 4d. and the real price not more than 54s. per qr.\* The extent to which these high and widely varying prices were affected by the European War has been the subject of controversy. As we mainly depended on the Continent for any addition to our own resources, the diminished production during the earlier years in the Netherlands, Germany and Italy, and in the later years of the war in Russia, Poland, Prussia, Saxony and the Peninsula, reduced possible supplies. At the same time the rates of freight and insurance, especially in the later years of the war, increased very considerably. Tooke mentions a freight of £30 per ton on hemp from St. Petersburg in 1809. On the other hand, a powerful impetus was given to home production, which was stimulated by Government action and private enterprise. Inclosure was encouraged by the General Inclosure Act of 1801, and 1,934 Inclosure Acts were passed from 1793 to 1815. The schemes for increasing and conserving food supplies were various. The Board of Agriculture, for example, offered prizes of 50, 30, and 20 guineas, respectively, to the persons who in the spring of 1805 cultivated the greatest number of acres—not less than 20—of spring wheat.† In 1795 a Select Committee recommended that bounties should be granted to encourage the cultivation of potatoes on “lands at present lying waste, uncultivated or unproductive,” and that means should at once be adopted to add at least 150,000, and perhaps 300,000 acres, to the land under cultivation “as the only effectual means of preventing that importation of corn, and disadvantages therefrom, by which this country has already so deeply suffered.” Another view of importation is presented by Tooke, who, in a discussion of the effect of the war, says: “Although the war cannot have been said to have operated upon the supply of agricultural produce of our own growth and other native commodities, sufficiently to outweigh the circumstances favourable to reproduction, it operated most powerfully in increasing the cost of production and in obstructing the supply of such

\* “Porter's Progress of the Nation,” by F. W. Hirst, p. 183.

† Annals of Agriculture, 1805.



commodities as we stood in need of from abroad. It is, therefore, to war chiefly as affecting the cost of production and diminishing the supply, by obstructions to importation, at a time when by a succession of unfavourable seasons our own produce became inadequate to the average consumption, that any considerable proportion of the range of high prices is to be attributed."\*

The main cause of high prices and scarcity was the failure of the harvests. Mr. Prothero thus analyses the wheat harvests of the 22 years, 1793-1814—"Fourteen were deficient; in seven out of the fourteen the crops failed to a remarkable extent, namely in 1795, 1799, 1800, 1809, 1810, 1811, 1812. Six produced an average yield. Only two, 1796 and 1813, were abundant; but the latter was long regarded as the best within living memory."†

It appears paradoxical, but in a sense it is true, to say that the scarcity of wheat in certain years arose from the fact that the country was too largely dependent on its own crop. The risk of a bad harvest in a climate such as that of the British Isles must always be serious, and by the fortune of war the risk between 1793 and 1814 turned out to be very high. When supplies are drawn from the four quarters of the globe it is evident that the risk of a shortage is greatly reduced. Whether in a great war it is preferable to be more dependent on the sea than on the season is debatable.

In comparison with wars for national existence such as that against Napoleon, and in a still sterner sense that in which we are now engaged, other conflicts appear insignificant. The Crimean war, however, did affect our food supplies, and had a reflex action on British agriculture. The cessation of imports from Russia caused a rise in the price of corn. The average price of wheat rose to 72s. 5d. per qr. in 1854, 74s. 8d. in 1855 and 69s. 2d. in 1856. Only once before (in 1839) during the previous 35 years had it risen above 70s. There were then no agricultural returns, but the estimates of Lawes, which were generally accepted, put the area under wheat at a little more than 4,000,000 acres, a higher figure than has been suggested for any other period. It is, indeed, highly probable that the Crimean war marked the maximum of wheat cultivation in this country. It was a time of great agricultural activity and of rapid progress. To their astonishment farmers had found, after an interval of panic, that the Repeal of the

\* "History of Prices," Ed. 1838, Vol. I., p. 116.

† "English Farming, Past and Present," p. 269.

Corn Laws had not obliterated British agriculture, and that even the price of wheat was not invariably lower than it had often been before 1846. Caird had preached "High Farming" in 1848 and found many disciples, capital was poured into the land, and the high prices of the Crimean period stimulated enterprise and restored confidence in agriculture.

To generalise very roughly it may be said that, while the Napoleonic wars were followed by the deepest depression in agriculture, the Crimean war was followed by a heyday of agricultural prosperity which lasted for over twenty years. What the agricultural sequel to the present war may be I leave others to estimate, and I turn to consider briefly some of its effects on British farming up to the present time.

Harvest had just begun when war broke out on the 4th of August; indeed, in the earlier districts a good deal of corn was already cut. The harvest of 1914 was, in fact, with the exception of that of 1911, the earliest of recent years, as it was also one of the most quickly gathered. The agricultural situation may, perhaps, be concisely shown by giving the returns of the crops then in hand, *i.e.*, in course of gathering or in the ground, with the numbers of live stock as returned on farms in the previous June. The figures are for the United Kingdom, and I add the average for the preceding ten years for comparison:—

						1914.	Average, 1904-13.
						<i>qr.</i>	<i>qr.</i>
Wheat	..	..	..	..	..	7,804,000	7,094,000
Barley	..	..	..	..	..	8,099,000	7,905,000
Oats ..	..	..	..	..	..	20,094,000	21,564,000
Beans	..	..	..	..	..	1,120,000	1,059,000
Peas ..	..	..	..	..	..	374,000	525,000
						<i>Tons.</i>	<i>Tons.</i>
Potatoes	..	..	..	..	..	7,470,000	6,592,000
Turnips and Swedes	..	..	..	..	..	24,190,000	26,901,000
Mangolds	..	..	..	..	..	9,522,000	9,934,000
Hay ..	..	..	..	..	..	12,403,000	14,148,000
						<i>Cwt.</i>	<i>Cwt.</i>
Hops	..	..	..	..	..	507,000	354,000
						<i>No.</i>	<i>No.</i>
Cattle	..	..	..	..	..	12,185,000	11,750,000
Sheep	..	..	..	..	..	27,064,000	29,882,000
Pigs ..	..	..	..	..	..	3,953,000	3,805,000
Horses	..	..	..	..	..	1,851,000	2,059,000

Farmers had thus rather more than their usual supplies of nearly every crop, the chief deficiencies being in peas, roots

and hay. The shortage of the hay crop was, however, in some measure made up by the large stocks left from the unusually heavy crop of 1913. It was fortunate, from the food supply point of view, that two of the most plentiful crops were wheat and potatoes. The head of cattle was very satisfactory, being the largest on record, and pigs were well above average. Sheep, always apt to fluctuate in numbers, were much below average, the total being the smallest since 1882, with the exception of 1913.

On the whole, it was a good year agriculturally, and the supply of home-grown produce at the beginning of the war was bountiful. Nature, at any rate, had provided for us more generously than we had a right to expect.

At first it appeared as if farmers were likely to be sufferers rather than gainers by the war. Prices of feeding-stuffs, especially linseed and cotton cakes, maize meal, rice meal and barley meal, rose at once, recruiting affected the labour supply, and difficulties arose in the distribution of produce by rail. With one or two exceptions, such as oats, the prices of farm produce showed but little rise for three or four months after the war began. Wheat rose about 10 per cent., barley remained about normal, cattle by November had not risen more than 3 per cent., sheep and veal calves showed no rise until December, while poultry was actually cheaper than usual, though eggs rose considerably. Butter rose slightly, and cheese remained about normal. Up to nearly the end of the year, in fact, it may be said, generally, that British farm produce made very little more money than usual.

Meanwhile the nation began to take a keen interest in the agricultural resources of the country, and farming became the object of general solicitude. We started with great energy to improvise, in truly British fashion, the means of facing the supreme crisis of our fate, but the elementary fact at once became obvious that it is impossible to improvise food produce. The main farm crops take an unreasonably long time to grow, even if the land is prepared for them, and a sudden extension of the area under cultivation is not a simple proposition. It was freely pointed out—with undeniable truth—that our agricultural system had not been arranged to meet the conditions of a great European war, and many suggestions were made to meet the emergency. Some of these suggestions involved intervention by legislative or administrative action. It was decided that any attempt violently to divert the course of farming from its normal channels would probably not result

in an increased total production from the land. The Agricultural Consultative Committee, appointed by the President of the Board of Agriculture on the 10th of August, issued some excellent advice to farmers as to their general line of policy and the best means by which they could serve the nation, and this was supplemented by the Board and by the agricultural colleges and local organisations throughout the country. More than 30 Special Leaflets have been issued by the Board, but while it may, I think, fairly be claimed that all the recommendations made officially were sound and reasonable, I should be the last to aver that farmers were universally guided by them. They do not accept official action effusively—

*“Unkempt about those hedges blows  
An English unofficial rose”*—

and official plants do not flourish in farm hedgerows. It was, however, fairly evident that patriotism would suggest an effort to obtain the maximum production from the land, and there were good reasons to think that self-interest would indicate the same course. It must be admitted, however, that during the autumn the lure of self-interest was not very apparent. Food prices, however, at the end of the year began to rise rapidly. English wheat in December was 25 per cent. above the July level, in January 45 per cent., in February and March 60 per cent., and in May 80 per cent. Imported wheat generally rose to a still greater extent, prices in May standing, for No. 2 North Manitoba 95 per cent., and No. 2 Hard Winter 90 per cent., above July level.

The greater rise in imported wheat may be noted as vindicating farmers in respect of the charge which was made against them of unreasonably withholding their wheat from the market. Cattle and sheep rose more slowly, but in March prices of both had risen by 20 per cent., and in May and June cattle had risen by about 40 per cent. Butter rose by about 20 per cent. and cheese by about 40 per cent. Milk rose little through the winter, but when summer contracts were made prices remained generally at the winter level.

British agriculture, like the British Isles, is a comparatively small affair geographically. The 47 million acres which it occupies, compared with the 80 million acres of Germany or the 90 million acres of France, and still more with the 290 million acres of the United States, represent an area which may be termed manageable and about which one might expect to generalise without much difficulty. But, in fact, generalisation is impossible. Even on the 27 million acres of farm land

in England and Wales there is probably more diversity to the square mile than in any country on earth. The variations in local conditions, class of farming and status of occupier, preclude the possibility of making any general statement without elaborate qualifications. Thus, whatever one might say as to the effects of the war on agriculture would be certain to be inaccurate in some districts and as regards some farmers.

There are three main agricultural groups: corn-growing, grazing and dairying. They overlap and intermingle indefinitely, and there are other important groups, such as fruit-growing, vegetable-growing, hop-growing, etc., which represent a very large share of the enterprise and capital engaged on the land. The receipts of the corn-growing farmer, generally speaking, were substantially increased. Probably about 50 per cent. of the wheat crop had been sold before prices rose above 40s. per quarter, and there was very little left on the farms when prices reached their maximum in May. Oats rose rather more quickly, but did not reach so high a level, relatively, as wheat. Barley—owing perhaps to enforced and voluntary temperance—never made exceptional prices, and, in fact, the best malting barleys were rather less than average value. There is no doubt, however, that farmers who depended mainly on corn-growing found an exceptionally good market for their crops and made substantial profits. Farmers who depended mainly on stock were generally less fortunate, although stock were at a fairly high level of price when the war began. Sheep for some time showed no signs of getting dearer, but in the spring prices rose substantially, and a good demand for wool—which in one or two cases touched 2s. per lb.—made the flockmasters' returns, on the whole, very satisfactory. Cattle followed much the same course; stores were dear, but by the time fat stock came out of the yards or off the grass prices had risen to a very remunerative level. The large demands on imported supplies of meat for the British and French armies occasioned a distinct shortage for the civil population, but this was relieved by a reduced demand, so that the effect upon prices of native beef and mutton was not so great as might have been expected. The influence of a rise of price upon demand is more marked in the case of meat than in that of bread. While there has been a distinct reduction in the consumption of meat there is no evidence of a reduced consumption of bread.

Dairy farmers generally found themselves in difficulties. Prices of butter and cheese increased but slightly, and milk

remained for a considerable period almost unchanged. The rise in the prices of feeding-stuffs and the loss of milkers aggravated their troubles. An actual instance of the position in February as affecting a fairly typical 200-acre farm may be quoted. It had 30 milch cows producing about 16,500 gal. per annum. The cake bill showed an advance of 50 per cent., and wages had risen 12 per cent. It was calculated that the extra cost was 1·3*d.* per gal. of milk. Later the prices of milk, butter and cheese rose, but, on the whole, it cannot be said that dairy farmers generally made exceptional profits.

While it is certain that the gross receipts by farmers were substantially increased, it is very difficult to estimate what the net pecuniary gain to agriculture has been. It can only be said, generally, that while some have made substantial profits, which were probably in very few cases excessive, many others have on balance (after allowing for extra cost) done no better financially, and some, perhaps, even worse, than in an average year of peace. With regard to one item of extra cost, that of labour, it is possible to make an approximate estimate. Agricultural labourers were among the first to respond to the call for the new armies, and, up to the end of January, 15 per cent. had joined the forces of the Crown. This considerable depletion of labour was not acutely felt by farmers during the winter, but during the spring and summer serious difficulty was experienced and many devices were suggested—some of which were adopted—for meeting it. Naturally the wages of those agricultural labourers who were left rose, the rise varying in different districts, but being generally from 1*s.* 6*d.* to 3*s.* per week. Owing to the rise in the price of commodities this increase of wages cannot be regarded as a profit to the labourers, but it is, of course, an outlay by farmers which in England and Wales may be reckoned as amounting to an aggregate of about £2,000,000.

This country has never suffered from a dearth of agricultural advisers, and, in such a time as the present, when everyone is anxious to help the country, it is natural that they should be unusually plentiful. Advice was freely offered both to the Government how to deal with farmers and to farmers how to deal with the land. Whether in consequence of advice or in spite of it, it may fairly be said that farmers throughout the United Kingdom have done their duty. They have met their difficulties doggedly, and have shown an appreciation of the situation which does credit to their intelligence. It was not

easy last autumn, when farmers had to lay their plans for the agricultural year, to forecast the future. We were all optimists then, and many thought that the war might be over before the crops then being planted were reaped. It was clear, however, that the national interest lay in maintaining and, so far as possible, increasing the produce of the land. In the quiet determined way which is characteristic of them, farmers devoted themselves to the task, and the returns recently issued give the measure of their achievement. They have added 22 per cent. to the acreage of wheat, and 7 per cent. to the acreage of oats, and they have kept the area of potatoes up to the high and sufficient level of the previous year. These are the three most important crops. They have also not only maintained the stock of cattle, which was the largest on record, but, in spite of unfavourable conditions and a bad lambing season, they have increased the stock of sheep. In view of these facts I venture to say that British and Irish farmers have shown both patriotism and intelligence, and may fairly claim to have contributed their share to the national effort.

The share of British agriculture in the food supply of the nation is more considerable than is sometimes realised. When I last had the honour to address the British Association I ventured to emphasise this point, and I may be allowed to repeat in a somewhat different form, and for a later period, the figures then given. Taking those articles of food which are more or less produced at home, the respective proportions contributed by the United Kingdom, the rest of the Empire and foreign countries were, on the average of the five years, 1910-14, as follows :—

	United Kingdom.	British Empire Overseas.	Foreign Countries.
	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>
Wheat .. .. .	19.0	39.3	41.7
Meat .. .. .	57.9	10.7	31.4
Poultry .. .. .	82.7	0.2	17.1
Eggs .. .. .	67.6	0.1	32.3
Butter (including margarine) ..	25.1	13.3	61.6
Cheese .. .. .	19.5	65.1	15.1
Milk (including cream) .. ..	95.4	0.0	4.6
Fruit .. .. .	30.3	8.3	53.4
Vegetables .. .. .	91.8	1.1	7.1

The war has directly affected some of our food supplies by interposing barriers against the exports of certain countries. Fortunately we were in no way dependent for any of these

foods upon our enemies, though Germany was one of our main sources of supply for sugar. We received some small quantities of wheat or flour and of eggs from Germany, Hungary and Turkey, some poultry from Austria-Hungary and some fruit from Germany and Turkey, but the whole amount was insignificant. The practical cessation of supplies from Russia was the most serious loss, as we drew from thence on an average 9 per cent. of our wheat, 9 per cent. of our butter and 16 per cent. of our eggs.

The rather humiliating panic which took possession during the first few days of the war of a certain section of the population, who rushed to accumulate stores of provisions, arose not only from selfishness but from insufficient appreciation of the main facts about food supplies. Our large imports of food are constantly dinned into the ears of the people, but the extent and possibilities of our native resources are practically unknown. It is very natural, therefore, that the man in the street should assume that even a temporary interruption of oversea supplies would bring us face to face with famine.

Within the first few days of the war the Government, through the Board of Agriculture, obtained returns not only of the stocks of all kinds of food-stuffs in the country but also of the stocks of feeding-stuffs for animals and of fertilisers for the land. Powers were taken under the Articles of Commerce (Returns, etc.) Act to compel holders of stocks to make returns, but it is due to the trading community to say that in only two instances, so far as the Board of Agriculture was concerned, was it necessary to have recourse to compulsion. The returns of stocks of food-stuffs, feeding-stuffs and fertilisers have been made regularly to the Board of Agriculture\* every month since the outbreak of war, and the loyal co-operation of the traders concerned deserves cordial recognition by those whose official duty has been rendered comparatively easy by their assistance. I may be allowed to add that the readiness with which traders communicated information, which was of course of a very confidential nature, displayed a confidence in Government Departments which they may regard with some satisfaction.

A very casual glance at the national dietary suffices to show that John Bull is an omnivorous feeder, and as the whole world has eagerly catered for his table his demands are exigent.

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\* Returns in Scotland and Ireland are made to the Agricultural Departments of those countries, and the results transmitted to the Board of Agriculture and Fisheries.



But, for various reasons, our daily bread, reluctant though most of us would be to be restricted to it, is regarded as the measure and index of our food supplies. On the 4th of August the Board of Agriculture published an announcement that they estimated the wheat crop then on the verge of harvest at 7,000,000 qr., and that, including other stocks in hand, there was at that time sufficient wheat in the country to feed the whole population for four months; and a few days later, having then obtained further information from about 160 of the principal millers, they stated that the supplies in the country were sufficient for five months' consumption. The Board also announced on the 5th of August that the potato crop would furnish a full supply for a whole year's consumption without the necessity for any addition from imports. When it was further announced that the Government had taken steps to ensure against a shortage of sugar it began to be generally realised that, at any rate, the country was not in imminent danger of starvation. Indeed, on a broad survey of the whole situation, it was apparent that our native resources, together with the accumulated stocks of various commodities held in granaries, warehouses, and cold stores, would enable the United Kingdom to face even the unimaginable contingency of a complete blockade of all its ports for a considerable period.

Nevertheless it was abundantly evident, not only to the man in the street, but even to those whose duty it was to consider such matters, that the maintenance of regular supplies was essential to avoid undue depletion of stocks. The risk that a certain number of vessels carrying food to this country might be sunk by the enemy was obvious, and it was at first very difficult to measure it. After a year of strenuous endeavour by the enemy it is satisfactory to record that, although a few cargoes of food-stuffs have been sunk, the effect on supplies has been practically negligible.

Under these circumstances it appeared that, provided adequate protection were given against unusual risks, commercial enterprise might in the main be relied upon to supply the demands of the people in the normal manner and in the usual course of business. It is a self-evident axiom that it is better not to interfere in business matters unless there is a paramount necessity for interference.

The machinery of modern business in a highly-organised community is very complicated; the innumerable cogwheels are hidden while the machine is running normally, but every

single one of these becomes very obvious when you attempt to introduce a crow-bar. With one or two exceptions the purveyors of food to the nation were left to conduct their business without official interference, though the Board of Trade took steps to ascertain what were the retail prices justified by the wholesale conditions and to disseminate the information for the protection of consumers against unreasonable charges.

One measure of a drastic and widespread nature was adopted. The exportation of a large number of commodities was prohibited. This was done for two reasons: (1) to conserve stocks in this country, and (2) to prevent goods from reaching the enemy. The latter object could be attained only very partially by this method so long as any sources of supply other than the ports of the United Kingdom were open to the enemy or to adjoining neutral countries. The former object—with which we are now only concerned—was, on the whole, achieved. The Board of Agriculture, concerned for the maintenance of our flocks and herds, at once secured a general prohibition of the exportation of all kinds of feeding-stuffs for animals. Many kinds of food-stuffs were at once included and later additions were made so that for a long time past nearly all kinds of food have been included, though in some cases the prohibition does not apply to the British Empire or to our Allies. The exportation of fertilisers, agricultural seeds, binder twine, and certain other commodities more or less directly connected with the conservation of our food supplies, was also prohibited, so that generally it may be said that the outlet for any food in the country was under effective control. This is not the time or place to discuss the reasons why in some instances limited quantities of certain articles were allowed to escape under licence. It is only necessary to remark that in all such cases there were cogent reasons, in the national interest, for the action taken.

Direct Government intervention in regard to food supplies was limited to three commodities—sugar, meat and wheat. In the case of sugar the whole business of supply was taken over by the Government, a huge undertaking, but administratively a comparatively simple one, owing to the fact that there are no home-grown supplies. Intervention in the meat trade was necessitated by the fact that the enormous demands of the Allied armies had to be met by drafts upon one particular kind of meat and mainly from one particular source. The Board of Trade co-operated with the War Office, and a

scheme was evolved whereby a very large part of the output of meat from South America and Australia comes under Government control.

As regards wheat the intervention of the Government took two forms. The scheme whereby the importation of wheat from India was undertaken by the British Government, in co-operation with the Indian Government, arose primarily from conditions in India rather than from conditions in the United Kingdom, although it is hoped and believed that the results will prove to be mutually advantageous. Other than this the intervention of the Government in regard to wheat was devised as an insurance against the risk of interruption of normal supplies, its main object being to prevent the stocks of wheat in the country from falling to a dangerous level at a time when the home crop would be practically exhausted. When the home crop is just harvested there are ample reserves in the country for some months, and as the United States and Canada are at the same time selling freely, stocks held by the trade are usually high. While home-grown wheat remains on the farms it is practically an additional reserve supplementary to the commercial reserves. When it leaves the farmers' hands, even although it may not actually go into consumption, it becomes part of the commercial reserve. This reserve in the nature of business tends to be constant, but fluctuates within rather wide limits under the influence of market conditions. If the price of wheat rises substantially, and the capital represented by a given quantity increases, there is a natural tendency to reduce stocks. If also there is any indication of a falling market ahead, whether from favourable crop prospects or the release of supplies now held off the market for any reason, a prudent trader reduces his stocks to the smallest quantity on which he can keep his business running. So long as shipments reach this country, as in normal times they do, with, as a member of the Baltic once expressed it to me, "the regularity of omnibuses running down Cheapside," the country may safely rely on receiving its daily bread automatically. But if any interruption occurred at a time when the trade, for the reasons just indicated, happened to be running on low stocks the margin for contingencies might be insufficient. I am, of course, debarred from discussing the method adopted or the manner in which the scheme was carried out, but as the cereal year for which it was devised is over, it is permissible to state that the object in view was successfully achieved.

Of the 47,000,000 people who form the population of the United Kingdom the large majority are absolutely dependent for their daily food on the organisation and regular distribution of supplies. The countryman, even if he possesses no more than a pig and a garden, might exist for a short time, but the town-dweller would speedily starve if the organisation of supplies broke down. He does not, perhaps, sufficiently realise the intricacy of the commercial arrangements which make up that organisation, or the obstacles which arise when the whole economic basis of the community is disturbed by a cataclysm such as that which came upon us thirteen months ago. The sorry catchword, "Business as usual," must have sounded very ironically in the ears of many business men confronted with unforeseen and unprecedented difficulties on every side. The indomitable spirit with which they were met, the energy and determination with which they were overcome, afford further evidence of that which has been so gloriously demonstrated on land and sea, that the traditional courage and grit of the British race have not been lost.

To the question, how have our oversea food supplies been maintained during the first year of the war, the best answer can be given in figures.

Imports of the principal kinds of food during the first twelve months of the war were as under, the figures for the corresponding period of 1913-14 being shown for comparison :—

	1914-15.	1913-14.	Increase (+) or Decrease (-)
	<i>Thousands of cwt.</i>	<i>Thousands of cwt.</i>	<i>Per cent.</i>
Wheat (including flour) .. ..	113,797	115,398	— 1.39
Meat .. ..	15,868	18,029	— 11.97
Bacon and hams .. ..	7,452	5,975	— 24.72
Cheese .. ..	2,760	2,389	— 15.93
Butter (including Margarine) ..	5,370	5,748	— 6.47
Fruit .. ..	18,830	17,512	— 7.53
Rice .. ..	9,573	4,840	— 97.79
Sugar .. ..	35,929	35,356	— 8.07

In total weight of these food-stuffs the quantity brought to our shores was rather larger in time of war than in time of peace. And one still occasionally meets a purblind pessimist who plaintively asks what the Navy is doing? This is a part of the answer. It is also a measure of the success of the much-advertised German "blockade" for the starvation of England. So absolute a triumph

of sea-power in the first year of war would have been treated as a wild dream by the most confirmed optimist two years ago. The debt which the nation owes to our sailor-men is already immeasurable. That before the enemy is crushed the debt will be increased we may be assured. The crisis of our fate has not yet passed, and we may be called upon to meet worse trials than have yet befallen us. But in the Navy is our sure and certain hope.

*"That which they have done but earnest of the things that they shall do."*

Under the protection of that silent shield the land may yield its increase untrodden by the invading foot, the trader may pursue his business undismayed by the threats of a thwarted foe, and the nation may rely that, while common prudence enjoins strict economy in husbanding our resources, sufficient supplies of food will be forthcoming for all the reasonable needs of the people.

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### SYSTEMS OF FARMING AND THE PRODUCTION OF FOOD.—THE NEED FOR MORE TILLAGE.

T. H. MIDDLETON, C.B., M.A., M.Sc.,

*Assistant Secretary, Board of Agriculture and Fisheries.*

THE following paper was read at the meeting of the British Association, held at Manchester, 7th-11th September, 1915:—

Since the outbreak of war the greatest interest has been taken by all classes of the community in questions relating to food production; the correspondence now received by the Board of Agriculture and Fisheries refers to a group of subjects to which the British public have paid little attention in recent years, but which a century ago occupied most of the office hours of Sir John Sinclair, Arthur Young, and other members of the staff of the old Board. To Germany the organisation of food production is of vital importance, and early in the war the subject engaged the attention of a committee of experts presided over by Dr. Eltzbacher, of Berlin. A summary of the report of this committee appeared in the *Lancet* last February, and recently an English translation has been issued by the University of London Press under the title "*Germany's Food. Can it last?*" Quite apart from the object of the enquiry and its bearing on present conditions, the report of Dr. Eltzbacher's committee is of much interest to agriculturists. The considerations

advanced, the lines of thought developed, and the methods for increasing food supply recommended, should help to stimulate production from the soil when peace follows war, and the committee's report is one which every student of agriculture may be recommended to read.

Some months ago, when I was asked by the committee of the Section to share in a discussion on *The Effects of the War on the Future of British Agriculture*, it appeared to me that one obvious question which might profitably engage our attention to-day is: "To what uses are we putting our English soil?"

Instead of discussing the financial aspects of different systems of agriculture it is desirable to enquire whether there may not be profits and losses of another kind which should receive the careful consideration of agriculturists responsible for the examination of the merits of various styles of farming. Discussion of the systems likely to produce the greatest amount of food were common enough towards the end of the 18th century and in the early years of the 19th, but our fathers and grandfathers gave the question little thought. The steamship and the railway appeared to them to make this subject of small practical importance. Now the possible developments of the submarine and the airship have modified the public's point of view, and the importance of growing more food within the country, not only as a war measure but after the return of peace, is being urged upon our attention by many thinking people.

I propose to restrict my paper to the examination of three systems of farming:—(1) the production of meat on grass land; (2) the production of milk on grass land; and (3) the production of meat and food crops on arable land. In each case I shall attempt to estimate the probable amount of human food produced. In the first place I shall estimate the quantity of saleable produce which each system is likely to yield, and I shall then endeavour to compare the values of the different kinds of produce as food for men. With the exception of the poor pasture I have assumed that the examples refer to well-farmed land; but to avoid overburdening the examples with figures I have restricted the crops grown and the kinds of stock kept; I have also excluded the food value of meat offals.

#### SYSTEM I.—*The Production of Meat on Grass Land.*

In this case, owing to the widely different quality of pastures, it will be desirable to estimate the yield on land of medium quality adapted for raising store cattle and sheep, on rich fattening pastures, and on the poorest type of grazing land.

A.—*Grazing Land of Medium Quality adapted for rearing Store Stock but not for Fattening Cattle.*—I propose to take as an example of land of this kind some fields on the Northumberland Experimental Station, Cockle Park, for which the records of 11 years' grazing (1904–1914) are available. The fields in question form part of the Hanging Leaves Fields Experiment. The land, which formerly grew wheat, was in very poor condition when the Experimental Farm was taken by the Northumberland County Council, but by using basic slag the pasture had been much improved before the experiment started. Since that time the land has been regularly manured and the grass is now of very fair quality. Each of the experimental fields is 10 acres in area. Two of them (Nos. I. and IV.) have been manured with basic slag, and slag and fish meal, respectively. The results have been similar (186 lb. live weight increase per acre on No. I. and 192 lb. on No. IV.) and the average returns from this area of 20 acres may be adopted for the purpose of our estimate.

The stock consisted chiefly of cattle, but sheep were also grazed. The numbers varied from season to season with the carrying capacity of the grass. The usual stock per 10 acres during the summer grazing season of 14 to 16 weeks varied from 6 to 8 cattle, with 6 ewes and 12 lambs. In addition there was autumn and winter grazing for sheep valued on the average of 11 years at 7s. 4d. per acre. The average annual live weight increase of the stock on Fields I. and IV. during the summer season has been 189 lb. per acre, the highest increase (1907) 250 lb., and the smallest (1905) 132 lb. The low yield in 1905 as compared with 1907 was partly due to the manuring; but the season is now the chief factor in modifying yield, for in 1910, when the manurial position was the same as in 1907, the yield was only 170 lb.

Of the average increase, 60 lb. comes from sheep and 129 lb. from cattle. The increase during autumn and winter grazing has not been determined, but the increase from sheep in the autumn on the adjacent experiment in Tree Field has been shown to be very small: usually about 2 lb. per acre per week in September. The average value of the winter grazing on Hanging Leaves has been estimated at 7s. 4d. per acre. Summer increase in cattle is valued at 2½d. per lb. Autumn and winter increase on grazing farms must cost at least 50 per cent. more to produce, so that 7s. 4d. worth at, say, 4d. per lb. would amount to 22 lb. Adding this to the summer increase, the total live increase of cattle and sheep would amount

to 211 lb. per acre. Experiments on sheep at Cockle Park show that in store stock the percentage of carcass to live weight increase during the grazing season is low, and it is improbable that so much as 50 per cent. of the total live increase is carcass, but for our present purposes it will be desirable to estimate that half the live increase represents carcass. It follows that this grass land of moderate quality which has been properly manured and carefully grazed has on an average of 11 years produced about 105 lb. per acre of lean meat.

*B.—Grass Land of High Quality adapted for Fattening Cattle.*—I have no definite records corresponding to those supplied for medium quality pasture by Cockle Park, and propose to base the estimate on information obtained from the occupier of some of the finest grass land I have seen. This fine grass land fattened one 3-year old bullock per acre in the early part of the grazing season, and after the first lot of cattle was marketed a second lot could be fattened if oilcake were used; if not the second lot could be made into very good store cattle suitable for fattening for the Christmas markets. It may be estimated that in the early grazing season of 90–100 days cattle would increase by 200 lb. per head and that of this amount 120 lb. would be fat meat. The second lot of cattle would increase by about 100 lb. in 70 days' grazing, and this increase would probably contain 55 lb. of moderately fat meat.

In the late autumn, there would be some grazing for store cattle and sheep which might produce about 30 lb. live increase and 15 lb. of lean meat. I estimate the average total yield from this land of first-rate quality at about 330 lb. live and 190 lb. carcass increase per acre. Under some conditions the live increase would be considerably greater, but it is unlikely that the actual production of meat would exceed 190 lb.

*C.—Grazing Land of Very Poor Quality.*—As an indication of the increase that may be expected from pastures of the poorest type, we may take figures available from experiments made in Northumberland, Northamptonshire, and Cambridgeshire, on boulder clay of very poor quality. The statement on p. 524 shows the live weight increase per acre, between the years 1900 and 1905, obtained on untreated soil in these experiments. The period has been selected as one in which all the experiments were in progress, and a five-year average in each is sufficient to correct seasonal variations. The yields in all three cases are similar, averaging 36, 47, and 53 lb. live weight increase per acre. The greater increase on the southern stations is probably due more to the warmer season, and the earlier period



at which grass comes in the spring, than to the soil. The average increase at these three stations, namely, 45 lb. live weight, may be taken as representing the amount which the poorest pastures are producing. The fourth column in the statement gives the increase on a pasture in Hampshire, which, although accounted poor in its own neighbourhood, is of much better quality than those above referred to. In that case the average live increase was 107 lb. per acre.

*Live Weight Increase per acre, from Unmanured Soil.*

Year.	Station.			
	Cockle Park, Northumber- land.	Cransley, Northants.	Hatley, Cambridge- shire.	Sevington, Hampshire.
	<i>lb.</i>	<i>lb.</i>	<i>lb.</i>	<i>lb.</i>
1900 .. ..	44	—	67	—
1901 .. ..	23	45	46	100
1902 .. ..	41	72	78	126
1903 .. ..	41	42	38	117
1904 .. ..	33	38	36	90
1905 .. ..	—	37	—	103
Average ..	36	47	53	107

Even in favourable grazing seasons it is unlikely that as much as 50 per cent. of the live weight increase would consist of meat on this poor land. The lack of condition of the sheep fed on such pastures at the end of the grazing season is very marked, and it is doubtful if 45 lb. live increase would on the average represent so much as 20 lb. gain in carcass, but for the purpose of my estimate 20 lb. of meat may be adopted as the return likely to be secured from an acre of very poor pasture.

*SYSTEM II.—Milk Production on Grass of Good Quality.*

In this case we may suppose the grass land to be suitable for dairying, of good, but not first-rate quality, and under good management; 100 acres should maintain from 25 to 30 cows and some young stock. Let us assume that 30 cows, 6 heifer calves, and 10 heifers constitute the stock; further, that the cows yield on an average 650 gal. of milk per annum. This would work out at 195 gal., or 2,000 lb. of milk, per acre. In confirmation of this estimate results obtained in experiments may be cited. At the Midland College, manured grass land stocked with good cows produced about 220 gal. of milk per acre. At Harper Adams College, on

unmanured land, about 190 gal. per acre was secured; and on well-manured land, 260 gal. It should be noted that in these experiments the whole of the land was producing milk, whereas on the 100-acre farm in question part of the grass is reserved for other stock.

In addition to milk, the farm should be credited with the sale of draft cows. Assuming that there was pasture available on which these could be fattened, an average of 5 cows per annum would be sold yielding, say, 3,500 lb. of meat or 35 lb. per acre. There would also be from 20 to 24 calves for sale. If sold at, say, one week old, for rearing, they would weigh about 65 lb. and contain 35 lb. of meat. This would give a total of 840 lb. of meat for the farm. Every second or third year a bull would be sold and the increase on this animal might amount to 160 lb. of meat per annum, bringing the total yield of meat to 45 lb. per acre per annum.

Under ordinary circumstances feeding stuffs would be purchased and a correspondingly larger stock maintained, but to avoid complicating the estimate it is assumed that the cows receive no winter food other than hay.

#### SYSTEM III.—*Production of Food Crops and Meat from Arable Land.*

In this case we may take as an example a farm of 100 acres of good loamy soil worked on an ordinary 4-course rotation. In order to make the example a simple one it is assumed that all the crops grown which are not required for the working horses are consumed by 50 2-year-old bullocks, house-fed for 26 weeks, and that no sheep or pigs are kept. The arable land is supposed to be cropped in the following way: (1) the root-break consists of 10 acres of mangolds, 10 of swedes and turnips and 5 of potatoes; (2) on land following roots there are 15 acres of barley and 10 of wheat; (3) the seeds are cut twice and converted into hay; (4) after seeds 15 acres of wheat and 10 acres of oats, for horse corn, are grown.

Wheat, barley and potatoes are sold. It is assumed that all inferior barley is ground and fed on the holding, and that about one-quarter of the crop is, on an average, disposed of in this way, the remainder being converted into beer. The exact disposal of the crops is indicated in the statement on p. 526. It will be seen that, when the horses and live stock have been supplied, 25 tons of potatoes, 450 bush. of barley and 750 bush. of wheat are available for sale. It is assumed that the wheat offals and brewers' grains are repurchased and used for the cattle.

The yield of meat has been calculated as follows:—It is supposed that 50 well-bred cattle, averaging 20 months old

*Estimate of Crops produced on 100 acres of well-farmed Arable Land of good quality, worked on a four-course rotation. Four working horses kept. Fifty 2-year-old bullocks house-fed for 26 weeks.*

Cropping.	Crop per acre.	Total Yield.	Disposal of Crops.				Sold.
			Kept for Seed.	Horses.	Fed to Cattle.	Used as Bedding.	
10 acres Mangolds .. ..	20 tons	200 tons	—	—	200 tons	Tons.	—
10 " Swedes and Turnips .. ..	10 "	100 "	—	3½ tons	15½ "	—	—
5 " Potatoes .. ..	7 "	35 "	3½ tons	—	6½ "	—	25 tons
15 acres Barley .. ..	44 bush.	660 bush.	45 bush.	—	165 bush.	—	450 bush.
10 " " straw .. ..	22 cwt.	16½ tons	—	—	6½ tons	10	—
10 " Wheat .. ..	30 bush.	360 bush.	30 bush.	—	30 tons	—	300 bush.
10 " " straw, &c. . .	1½ tons	15 tons	—	—	3 tons	12	—
25 acres Seeds hay (cut twice)	40 cwt.	50 tons	—	16 tons	34 tons	—	—
15 acres Wheat .. ..	36 bush.	540 bush.	45 bush.	—	45 bush.	—	450 bush.
10 " " straw, &c. . .	1½ tons	22½ tons	—	—	4½ tons	18	—
10 " Oats .. ..	48 bush.	480 bush.	40 bush.	410 bush.	—	—	—
10 " " straw .. ..	1½ tons	15 tons	—	—	15 tons	—	—

and 900 lb. live weight, are purchased in the autumn and fed for 180 days on an average daily ration of 84 lb. roots, 3½ lb. grain and millers offals, 8 lb. hay and 8 lb. straw. Well-

managed cattle fed on this ration should put on about  $1\frac{1}{2}$  lb. live weight per day, or 15,750 lb. in the period; 60 per cent. of the increase may be reckoned as carcass, so that the total carcass increase would amount to 9,450 lb. of fat meat. In the example it has been assumed that the cattle are fed entirely on the products of the farm. Better results would usually be got by selling more barley and purchasing oil-cakes. Much more food might be produced if more intensive methods of farming had been adopted, and if dairy cows partly replaced fattening cattle.

In addition to meat the sales include wheat, barley and potatoes. It is assumed that the wheat yields 70 per cent. of flour and 25 per cent. offals available for stock feeding; that the barley is converted into beer (54 lb. producing 10½ gal. beer and 14 lb. dried grains); that the dried brewers' grains are given to cattle, and that the potatoes are sold during the autumn and winter. As potatoes are subject to waste in keeping and also in preparing for food, a loss of 20 per cent. has been allowed for; thus of the 25 tons available for sale 20 tons only are assumed to be eaten.

The total amount of produce reaching the consumer's table would thus be :—

Meat, including bone, etc.	.. ..	9,450 lb.
Wheat flour	.. ..	31,500 "
Potatoes	.. ..	44,800 "
Beer	.. ..	4,725 gal.

The results obtained by the different systems of farming which have been discussed may now be summarised. The quantities of food which an acre has been estimated to produce are :—

I. Grazing, Medium Pasture, Meat	105	lb. per acre.
Rich	" "	190 " "
Poor	" "	20 " "
II. Dairying, Good	" Milk	2,000 }
" "	" Meat	45 }
III. Arable Land, Wheat Flour	345	} " "
" " Potatoes	448	
" " Meat	94	
" " Beer	498	

#### *The Food Value of different kinds of Produce.*

The value of these farm products as human food may next be considered. They include produce differing widely in composition, as wheat flour and potatoes, meat of two kinds, and a beverage. With the object of reducing the number of figures it will be desirable to assume in the following discussion that the meat consists of beef only, the increase derived from sheep being added to the increase of cattle. It will also be

necessary to adopt a suitable standard or standards of comparison, the foods having different properties. Money value, which forms the usual measure, is unsuitable, since the physiological value of a food does not depend on the price. Instead of treating the human animal in the usual way and supplying him with as many pounds of beef, potatoes and beer as he chooses to pay for, we must deal with him as we do with farm animals and enquire into the composition of the daily ration of albuminoids, fats and carbohydrates which he actually requires.

In the first place let us recall the fact that foods are required by the animal for two distinct purposes, namely, to supply (1) the materials from which the body is built up, from which secretions like milk are made and from which the daily waste of the tissues may be repaired; (2) the fuel which in the body is converted into heat and work.

Common foods contain three groups of constituents, the proteins (albuminoids), fats and carbohydrates. If small quantities of certain salts, always present in mixed foods, are provided, the proteins can perform both the functions required of a food. Fats and carbohydrates, in the absence of protein, could only produce heat and work. It follows that in estimating the relative values of the different foods produced by a farm we must adopt two standards, and ascertain (1) the amount of digestible protein, (2) the total amount of energy which the food can supply.

Since digestible protein is an expensive food to produce and is worth no more for the production of energy than the cheap carbohydrates sugar and starch, economical rations aim at supplying as small a part of the total food requirements in the form of digestible protein as possible. For the purpose of the estimates which follow, I have allowed  $\frac{1}{4}$  lb. digestible protein as a sufficient daily ration for an average man doing a moderate amount of work, and I have further assumed that enough digestible fats and carbohydrates must be added to the protein to give a total energy value of 3,500 calories per day.\*

The requirements of a man vary, of course, with his size and still more with his activity, and there is a good deal of difference of opinion as to the actual ration necessary for the ordinary individual. The Eltzbacher committee have come to

\* The calorie is the unit adopted in measuring the capacity of foods to produce heat and work in the animal body. It consists of the amount of energy which when expressed as heat would raise the temperature of 1 kilogramme (2.2 lb.) of pure water from 0° C. to 1° C.

the conclusion that the average German civilian requires from 70 to 80 grammes of digestible protein (about  $\frac{1}{8}$  lb.) and 3,000 calories daily ; they agree that 4,000 calories, or more, may be needed by men who exercise their muscles freely, but argue that even when working hard an average healthy adult need not increase his protein ration. There are very special reasons why Germany must economise protein at the present time, and in selecting a more liberal ration than that recommended by the Berlin committee in framing these estimates, I have followed the opinion of Atwater, whose extensive investigations into the dietaries of different nations entitled him to write with authority on a subject depending on so many variables as the human ration. It is within the ordinary experience of all of us that not only do food-stuffs differ in composition and average digestibility, but that the digestion of the individual varies with himself, his miller, his baker and his cook. On the other hand, since my object is to estimate the full capacity of farm land to produce food, I have made no allowance for extravagance. I have, therefore, selected  $\frac{1}{4}$  lb. of digestible protein and 3,500 calories, as indicating the composition of a moderate diet on which the average man may maintain a very comfortable existence and, if he does not take much exercise, may even grow fat !

In the table printed on page 531 I have estimated the weight of digestible protein and the number of calories yielded by meat, milk and other farm produce. The calories have been ascertained by assuming that 1 lb. of digestible protein or carbohydrate would yield 1,860, and 1 lb. of fat 4,225, calories. The barley crop presents some difficulty. The calorific value has been calculated on a beer containing 5 per cent. of alcohol and 5.5 per cent. of solids. I have assumed that the beer solids are equal to carbohydrates, and that 1 lb. of alcohol yields 3,175 calories. These estimates are doubtful, and the energy value of beer may be less than one-half of the figure given. On the other hand, the Berlin committee state that about 60 per cent. of the energy value of barley is recovered in beer ; this is about twice as much as I have estimated, and I have not seen any analyses of German beers that suggest so high a food value.

Wheat flour, potatoes and milk are all fairly constant in composition and average analyses have been assumed.\* Meat

\* *Wheat flour* is assumed to contain 11.1 per cent. protein (88 per cent. digestible), 1 per cent. fat, and 75 per cent. carbohydrates (98 per cent. digestible) ; *Potatoes* to contain 1.2 per cent. pure protein (85 per cent. digestible), .9 per cent. amides, .2 per cent. fat, and 21 per cent. carbohydrates (95 per cent. digestible) ; and *Milk* to contain 3.1 per cent. protein (98 per cent. digestible), 3.6 per cent. fat, and 4.8 per cent. carbohydrates.

presents a somewhat complex question, as it is subject to very wide variations in composition.

It will be observed that in most cases the figures relate to the increase in live-weight of animals of 20 months' old or more. From the experiments made by Lawes and Gilbert at Rothamsted and by Atwater and others in America I have adapted the following scale :—

*Composition of Carcass and Carcass Increase.*

—	Protein.	Fat.
<i>Increase.</i>	Per cent.	Per cent.
Store Cattle on grass .. ..	14	49
Fattening Cattle 20-26 months..	10	55
Half fat 3-year-old Cattle on grass .. ..	10	55
Fat 3-year-old Cattle on grass .. ..	8	60
<i>Carcass.</i>		
Week-old calves .. ..	18	14
Fat cows .. ..	16	30

It must be pointed out that not only are figures relating to the composition of carcass *increase* of animals few in number, but that the composition of the increase in the case of store cattle must vary widely. Every purchaser of cattle in late autumn for winter fattening knows how variable their condition is and how much it depends on the weather of the second half of the grazing season. Atwater's analysis shows that the whole carcass of a moderately fat animal suitable for the butcher may contain 30 per cent. fat; Lawes and Gilbert found 34·8 per cent. fat in a fat ox and 22·6 per cent. in a half fat ox. The same authors take 16 per cent. fat as representing the composition of the carcass of lean oxen. These figures sufficiently indicate how widely the composition of the increase made by store animals at grass may vary; for in a good season stores come off the pastures in a moderately fat condition while in a bad year they may leave the pastures for the farm buildings increased in weight, but as lean as when they went to grass in spring.

In studying the production of food in the table on p. 531, it is necessary, therefore, to remember that not only does the actual increase of animals fed on pasture vary, but that the composition of the increase must vary within somewhat wide limits. In the case of house-feeding the fluctuations are very much less.

#### *Results and Conclusions.*

The results secured from the three systems of agriculture, grazing, dairying and arable farming, which have been discussed

above, are set out in the following table in a way that admits of a fair comparison being made between them. The figures are given per acre, but it should be noted that the several kinds of produce of the arable farm do not represent the crops of an acre but  $\frac{1}{100}$ th part of the crop of a 100-acre farm; thus in the last column the figure 53 opposite potatoes is that derived from  $\frac{1}{20}$  acre of potatoes. Similarly on the grass farm each acre is assumed to yield 2,000 lb. milk and 45 lb. meat.

FOOD PRODUCED UNDER DIFFERENT SYSTEMS OF FARMING.

(Figures per Acre).

Type of Farming and Produce.	Food.	Digestible Protein.	Energy Value.	Number of Days Ration for Man.	
				Protein.	Energy Value.
(1)	(2)	(3)	(4)	(5)	(6)
	lb.	lb.	Calories.		
I.—GRAZING.					
(a) Meat on Medium Pasture .. ..	105	14.3	204,000	57	58
(b) Meat on Rich Pasture .. ..	190	16.7	488,400	67	140
(c) Meat on Poor Pasture .. ..	20	2.7	38,800	11	11
II.—DAIRY FARMING.					
Good Grass.					
Milk .. ..	2,000	67.0	607,400	268	174
Meat .. ..	45	7.0	60,200	28	19
Total Products ..	—	74.0	673,600	296	193
III.—MIXED ARABLE FARMING.					
Good Land.					
Produce—Wheat					
Flour .. ..	315	31.6	502,700	126	144
Potatoes .. ..	448	8.6	185,300	34	53
Meat .. ..	04	0.2	230,000	37	68
Beer .. ..	498	2.5	111,200	10	32
Total Products ..	—	51.9	1,030,000	207	296

The final column in the table compares the systems of farming on the basis of the total amount of energy (heat and work) which they are capable of yielding to the human body. Provided that the rations contain a sufficient amount of digestible protein, these energy values may be accepted as a correct measure of food-producing capacity of land farmed as in the foregoing examples.



The differences are very striking. A well-managed arable farm is shown to be capable of supplying about twenty-seven times as much human food as is now produced by our poorest enclosed pastures, five times as much as pastures of moderate quality, twice as much as rich pastures, and about one-half more than well-managed grass dairy land. The arable farm is assumed to fatten cattle, the cropping not being well adapted for the keeping of dairy cows. If some grass land had been attached and all the feeding materials available on the farm had been converted into milk, then, making the very liberal allowance of 10 lb. digestible organic matter for the production of 1 gal. of milk, 155 gal. of milk per acre would have been secured in place of 94 lb. of meat, and the energy value of the arable farm would be increased from 296 to 367 days' food supply and the protein yield from 207 to 383 days' supply.

Under ordinary conditions the energy value is the best measure of the real value of the soil to the population ; but, in a country cut off from outside supplies of food, protein may become of equal or greater importance. The report of the Eltzbacher committee shows that from the information available last autumn, Germany was expected to have in stock more than enough food to supply the energy required within the harvest year, but that there was an anticipated shortage of protein, so that the existing supplies could only be made to serve the whole population if the German people altered their manner of living and observed the most rigid economy in the use of foods rich in protein. From the present German point of view the protein figures in the table would, therefore, be of much greater importance than those relating to energy. The value of milk production is clearly brought out when this standard is applied ; it will be seen that the dairy farm provides supplies for 296 days as compared with 207 days on the meat-producing arable land. (The crops of the arable land were not selected with the object of getting a high yield of protein. If this were necessary the growing of a few acres of beans and peas would improve the position.) From the standpoint of the balanced ration it may be worth while indicating how well the ordinary mixed farm of two-thirds arable and one-third grass land, producing both meat and milk, would fulfil the requirements of a self-supporting system of agriculture. By combining the products of the dairy and arable farms in the table in the proportion one-third and two-thirds we get 237 days' supply of protein and 261 days' supply of energy.

The protein figures for grazing farms are also interesting. It will be seen that the differences between rich and medium

pasture are much reduced when protein production is substituted for energy production. The reason for this is, of course, that the extra yield of a fattening pasture is mainly fat; but so long as protein can be obtained from other sources, and properly fattened cattle make much higher prices than lean animals in the meat markets, it is desirable to use rich pastures for fattening animals.

Finally, it may be noted that the difference between the returns from the poor and the medium pastures in the particular examples cited above is not due to the soil; the soils are similar and the medium quality pasture has been secured by manuring part of the poor land properly and grazing it skilfully. In cases of this sort the money profits are always substantial; this is proved by the reports issued by the Northumberland County Council on Cockle Park Farm, and there is the further advantage to the public that the improved land is likely to produce five times as much food as the unimproved. The question that forces itself upon us in the middle of this long and exhausting war is this—Can the nation any longer afford to neglect the development of the resources now lying latent in its unproductive grass land?

## ON GROWING TWO WHITE-STRAW CROPS IN SUCCESSION.

E. J. RUSSELL, D.Sc.,

*Director, Rothamsted Experimental Station, Harpenden, Herts.*

THE high prices that have been obtained for wheat during the past nine months have caused many farmers to enquire how far it would be feasible to modify their rotation, so as to grow more wheat during the coming year. It is obvious that, on land already in cultivation, any increase in the wheat acreage must be at the expense of something else, and, before any steps are taken in any particular case, the farmer must satisfy himself that it would be advantageous to produce wheat, instead of the crop that is to be displaced. Each man must decide this point for himself with the help of his expert advisers. The object of this article is to state the conditions under which the ordinary rules of farming have been set aside, and both wheat and barley have been grown for many years on the same land without any marked diminution in yield.

It has long been a tradition of farming that two white-straw crops should not be grown in succession, and the tradition still lives on, in spite of numerous instances where

the practice has been a success; indeed, in some cases, the terms of tenancy still prohibit the practice.

The classical proof that white-straw crops can follow one another without deterioration of the land is afforded by the fields of Rothamsted, where wheat has been grown continuously on the same land for 72 years, with only two seasons' break for fallow, and barley has been grown for 62 years, with only one season's fallow. The experiment was repeated at Woburn, on a much lighter soil, where forty-five crops of wheat have been taken off the same land without any break, and forty-five crops of barley off the barley plots. As a commercial proposition, wheat was grown continuously on Mr. Prout's land at

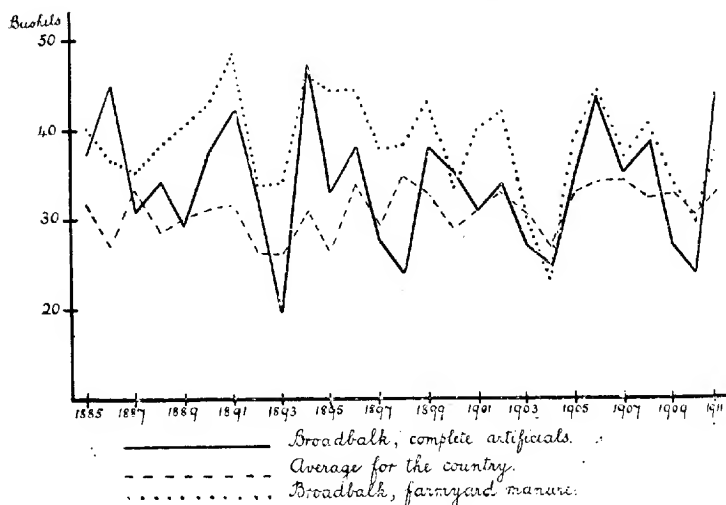


FIG. 1.—Yields of wheat from Broadbalk plots manured with complete artificial manures, and farmyard manure, respectively, compared with the average yield for the whole country.

Sawbridgeworth for 50 years, and this plan was continued until he gave up the farm in 1911.\* Other instances are also known where wheat has been grown for a succession of years on the same land, and it may be taken as proved that the practice is quite feasible.

The yields in four of the Rothamsted continuous wheat plots are set out in Table I., and two of them are plotted in Fig. 1,

\* Mr. Prout's system is described in "Profitable Clay Farming under a Just System of Tenant Right," by John Prout, 1881, one of the most interesting books on farming the writer has read; and in a Paper by W. A. Prout and J. A. Voelcker, "Continuous Corn Growing in its Practical and Chemical Aspects" (*Journ. Roy. Agric. Soc.*, 1905, Vol. 66, pp. 25-51.)

TABLE 1.—Yield of WHEAT (bushels per acre) grown continuously on the Rollamsted plots, receiving farmyard manure, complete artificials, and no manure respectively.

	1844	'45	'46	'47	'48	'49	'50	'51	Average 8 years.
No Manure	15.0	23.3	18.0	16.9	14.8	10.3	15.9	15.9	17.4
Farmyard Manure	22.0	32.0	27.3	30.0	25.6	31.0	28.5	29.6	28.2
No Manure	185.2	'53	'54	'55	'56	'58	'59	'61	Av. 10 years.
Farmyard Manure	31.0	5.9	21.1	17.0	14.5	20.0	18.0	12.9	15.3
Farmyard Manure	27.0	11.1	21.1	21.3	41.3	39.8	30.3	34.2	34.2
Complete Artificial	55.5	11.3	38.8	29.6	32.4	43.8	37.5	33.6	31.5
No Manure	186.2	'63	'64	'65	'66	'68	'69	'71	Av. 10 years.
Farmyard Manure	16.0	47.3	10.5	13.4	12.1	8.9	16.6	14.3	15.0
Farmyard Manure	38.1	41.0	40.0	37.1	32.6	27.5	41.8	38.3	37.5
Complete Artificial	43.5	55.5	51.1	44.1	34.5	29.1	47.8	39.0	42.5
No Manure	187.2	'73	'74	'75	'76	'77	'78	'80	Av. 10 years.
Farmyard Manure	15.8	21.8	8.7	8.6	8.9	12.4	4.8	11.5	10.2
Farmyard Manure	53.4	26.8	70.3	28.9	33.9	40.1	18.1	36.3	28.8
Complete Artificial	40.8	35.8	38.5	30.9	33.1	37.3	22.0	34.6	31.8
No Manure	188.2	'83	'84	'85	'86	'87	'88	'89	Av. 10 years.
Farmyard Manure	11.9	13.9	13.4	13.4	9.0	11.9	10.0	12.3	12.7
Farmyard Manure	31.8	32.4	30.5	31.8	30.9	40.5	48.1	38.2	38.2
Complete Artificial	31.8	44.4	40.5	34.4	30.8	28.9	20.3	34.8	30.8
Average for whole of England	---	---	---	31.1	32.4	28.2	29.9	31.3	(30.4)
No Manure	188.2	'93	'94	'95	'96	'97	'98	'99	Av. 10 years.
Farmyard Manure	0.4	38.0	10.0	16.8	8.9	12.0	12.0	12.3	12.1
Farmyard Manure	31.4	45.8	42.5	37.7	32.5	27.8	42.8	30.2	30.2
Complete Artificial	31.8	39.4	42.0	34.2	27.8	25.8	27.5	34.9	30.9
Average for whole of England	---	---	---	37.8	32.4	25.8	28.4	28.8	27.4
(smaller dressing)	---	---	---	40.2	33.9	29.0	31.8	30.6	29.9
No Manure	190.2	'03	'04	'05	'06	'07	'08	'09	Av. 10 years.
Farmyard Manure	13.3	7.6	4.2	18.0	15.2	9.1	12.4	9.1	10.1
Farmyard Manure	41.5	29.7	22.3	38.5	43.6	36.1	39.8	29.1	30.7
Complete Artificial	33.5	28.8	44.1	34.2	43.1	34.7	36.1	23.0	40.4
Average for whole of England	---	---	---	32.7	33.0	31.2	34.3	23.7	28.5
(smaller dressing)	---	---	---	36.9	33.0	31.0	31.2	25.6	31.6

where also are shown the average yields over the whole country for each year. There has, of course, been a falling off on the unmanured land, but this is less than might have been expected ; for the last 40 years the yield has been fairly steady, and has averaged  $11\frac{1}{2}$  bush. against  $17\frac{1}{2}$  bush. for the first five years of the experiment. The plot supplied with farmyard manure shows no falling off, but, on the contrary, a rise : for the first 8 years the yield averaged 28 bush., and for the last 10 years 35 bush. Except in a few really bad years, such as 1912, 1904, and 1879, the crop has been consistently good ; whilst often, as in 1892, 1893, 1895, and 1900, it has still been good in spite of the big drop in the average yields for the whole country. The most interesting plot for our present purpose, however, is that supplied with complete artificials, as this most closely represents the case where wheat is grown on a spring dressing. For the first 30 years the yield was well above that on the dunged plot. It has fallen off since, but it was maintained for a sufficiently long period to show that no fall need be anticipated in practice.

The barley results are given in Table II., and lead to substantially the same conclusions. On the dunged plot the yield increased for the first 30 years, and has suffered only a small fall since, whilst complete artificial manures maintained the crop at a good level for the first 20 years, though the yield has not been quite so good in later seasons. Thus it is evident that, provided the proper steps are taken, the average yield can be kept up under a system of continuous corn growing.

For our present purpose, however, we are concerned more with the fluctuations from season to season than with the average. The advantages of rotations are so manifest that no one would advocate any other plan as a permanent system of agriculture or in ordinary circumstances ; but to those farmers who, for the period of the war, desire to break their ordinary rotation and get in another corn crop, it is important to know the extent of the fluctuations that may occur. Reference to the diagram shows that the wheat crop which is grown on dressings of artificials does fluctuate more than that on the dunged plots, and that, in a bad year, it is liable to fall considerably, although in a good year it is equally liable to run high. This is further proved by the data in Table III., in which the wheat grown in rotation is compared with the wheat grown continuously. In the good years the continuous wheat comes out high, but in the bad years it is considerably lower.

On an average the Agdell plot, on which wheat is grown in

TABLE II.—Yield of BARLEY (bushels per acre) grown continuously on the Rothamsted plots, receiving farmyard manure, complete artificials, and no manure respectively.

	1852	'53	'54	'55	'56	'57	'58	'59	'60	'61	Average, 10 years.
No Manure	27.3	28.8	35.0	31.0	13.9	26.1	21.1	13.5	13.3	16.3	22.3
Farmyard Manure	35.0	46.1	55.0	48.4	31.8	52.3	55.0	40.0	41.6	54.4	45.0
Complete Artificials	40.8	38.3	60.6	58.4	31.8	37.4	51.3	34.6	43.5	54.6	46.1
Average for whole of England	1862	'63	'64	'65	'66	'67	'68	'69	'70	'71	Average, 10 years.
No Manure	16.5	22.9	34.0	18.0	15.9	17.1	15.6	15.1	13.5	26.8	17.5
Farmyard Manure	49.8	59.5	62.0	52.8	53.1	45.0	43.6	40.0	41.6	54.4	45.0
Complete Artificials	47.6	55.4	55.6	46.5	47.0	43.8	34.6	40.3	38.0	46.3	46.4
Average for whole of England	1872	'73	'74	'75	'76	'77	'78	'79	'80	'81	Average, 10 years.
No Manure	10.2	14.0	17.6	12.5	12.8	17.0	10.0	6.3	18.8	17.9	13.7
Farmyard Manure	38.0	51.3	67.6	39.0	35.8	30.1	46.3	36.0	65.3	55.8	50.2
Complete Artificials	36.8	46.8	45.8	30.0	35.8	30.1	33.5	27.3	54.8	42.5	40.9
Average for whole of England	1882	'83	'84	'85	'86	'87	'88	'89	'90	'91	Average, 10 years.
No Manure	18.3	16.3	13.7	9.3	11.0	7.5	12.3	11.3	11.0	15.3	13.8
Farmyard Manure	48.3	55.4	55.4	49.3	41.3	26.0	45.0	42.0	51.0	11.8	42.7
Complete Artificials	50.4	52.0	42.3	35.0	32.2	37.8	43.5	15.8	40.4	40.5	40.7
Average for whole of England	1892	'93	'94	'95	'96	'97	'98	'99	1900	'01	Average, 10 years.
No Manure	8.3	8.3	10.0	13.3	11.8	5.0	10.7	8.0	8.3	5.0	10.0
Farmyard Manure	54.8	46.0	40.3	37.8	43.0	51.0	51.0	42.0	41.8	25.0	40.0
Complete Artificials	50.6	10.8	44.2	31.3	31.5	32.5	35.5	29.8	21.0	24.8	30.2
Average for whole of England	1902	'03	'04	'05	'06	'07	'08	'09	1910	'11	Average, 10 years.
No Manure	24.3	22.3	6.2	6.5	11.0	7.7	7.2	13.0	9.0	4.0	9.3
Farmyard Manure	44.3	40.6	32.0	39.4	31.5	42.1	32.6	40.3	43.0	25.0	44.3
Complete Artificials	40.3	31.0	30.5	33.5	31.7	31.7	31.5	36.8	38.6	28.4	36.4
Average for whole of England	1912	'13	'14	'15	'16	'17	'18	'19	'20	'21	Average, 10 years.
No Manure	34.8	31.0	30.5	33.5	31.7	31.7	31.5	36.8	38.6	28.4	36.4
Complete Artificials	34.8	31.0	30.5	33.5	31.7	31.7	31.5	36.8	38.6	28.4	36.4
Average for whole of England	1912	'13	'14	'15	'16	'17	'18	'19	'20	'21	Average, 10 years.

rotation following clover, gives a yield of 35 bush. against 30 on Broadbalk, on which wheat is grown continuously, and the former is also a much steadier crop. It has only twice fallen below 25 bush., once in 1867, and again in that notorious year of disaster 1879, when it was as far down as 13 bush. But the Broadbalk continuous wheat fluctuates to a much greater extent, and the yield has frequently dropped below 25 bush.

TABLE III.—*Steadying effect of Clover Residues on Yield of Wheat grown in Rotation.*

		Agdell. After clover ploughed in ; complete artificial.	Broadbalk. After previous wheat crop ; complete artificial.
		Bush.	Bush.
Average of all ..	.. ..	35	30
Highest yield, 1863 ..	.. ..	46	56
Bad years, 1871 ..	.. ..	25	13
" " 1875 ..	.. ..	31	11
" " 1879 ..	.. ..	13	5
" " 1903 ..	.. ..	28	24

Thus it is more speculative to grow wheat in succession than in rotation, and hence the practice is justifiable only where the working cost is low so that no great amount of money is involved, as in prairie farming, or else where prices are high, as in our present war conditions. The practical conclusion is, therefore, that the farmer can, if he wishes, take wheat after wheat, instead of following his ordinary rotation, but he runs greater risk of diminished yields if the season turns out to be bad. There is less risk when farmyard manure is used than when artificials are applied.

Experience has shown that two conditions are essential to success : (1) First and foremost the land must be reasonably clean, and fortunately the farmer can see this before making up his mind in the matter. If the land is foul, the risk of failure is too great to be worth taking. If it is fairly clean, however, the best procedure is to cart the shocks as speedily as possible and plough at once. All experience demonstrates the necessity for this. At Rothamsted it has always been recognised that success could only be achieved by ploughing early and then sowing early. Mr. Prout threw down his hedges and straightened out his fields so that he could save time, and he used to put his steam tackle to work immediately the standing corn was out of the way.

It has been suggested (though the writer is not aware of any actual experiments) that a quicker and equally effective preparation for the second wheat crop would be to send the disc

harrow over the land immediately the crop is off, in order to break up the surface and cause the retention of sufficient moisture to allow of the germination of weed seeds. The young weed plants could then be destroyed by the subsequent ploughing.

In spring it is necessary to have recourse to horse-hoeing, and if necessary to hand-weeding to keep the crop clean.

At the present time the land is in a not unfavourable state for extra wheat crops. The summer has not been wet enough for the formation of the beds of couch which give so much trouble, but which, nevertheless, must be got rid of before corn crops will grow.

If a farmer were deliberately setting out to grow two successive crops of wheat his most hopeful way would be to take an early sort as the first crop and a late-sown variety as his second, so as to lengthen the interval available for autumn cleaning.

(2) Assuming that the land is reasonably clean, the second requisite is a suitable spring dressing. In the ordinary way a spring dressing would be applied only if the crop seemed to require it. A second corn crop, however, must be treated more generously, and should receive a spring dressing as a matter of course; even if the corn looks well at the beginning of the year it is liable to finish badly unless it is given some help.

The spring dressing has to be based on the rather special circumstances of the second crop. In the first place, the tilth is not likely to be as good after a previous corn crop as after, say, a root crop, and if much rain falls in winter the condition of the soil in spring may be unsatisfactory. Soot is a useful corrective for this, and its effects are too well known to need description. Unfortunately, it is rather an indefinite substance, and cannot always be obtained. Chemistry has come to the rescue and placed the active fertilising ingredient on the market in the form of sulphate of ammonia. Whether this is a complete substitute for soot is not clear, and could only be ascertained by a definite experiment, but, at any rate, it tends to improve the tilth and should be used whenever there is any difficulty in this direction and where soot cannot be got in sufficient quantities. In the second place some nitrogen compound is almost always necessary, and this may be supplied by soot, sulphate of ammonia, or nitrate of soda. As a rough guide, 1 bush. of soot may be regarded as containing 1 lb. of nitrogen, so that 22 bush. of soot, which would be quite an ordinary dressing, would be equivalent to 1 cwt. of sulphate of ammonia.

Sulphate of ammonia should go on early, before the crop begins to show the need for it. The farmer must make up his mind that a spring dressing is desirable in any case and put it on.



When there is no difficulty about tilth, nitrate of soda may be used. It gives rather a bigger yield per unit of nitrogen and has rather less tendency to cause the crop to lodge, or the straw to lose colour. In present circumstances it has the further advantage of increasing the supplies of potash available to the plant. If the winter turns out wet, however, it should not be used on heavy lands that have "poached" badly.

Phosphates also are needed. They help the young wheat plant to get over the difficulty of a bad tilth in spring, and they give it an early start, the advantage of which is felt all through its life. For this special purpose superphosphate is the best fertiliser to use.

The question of amount is not easy to decide. The Rothamsted experiments have shown that, so long as the dressing is suitable and within reasonable limits, the more that is put on the bigger the crop. Certain disadvantages may become manifest when large dressings are used: the crop may be laid, or the straw lack brightness of colour, but the total yield increases. Beyond a certain point, however, the extra crop does not pay for the extra manure. This is shown in Table IV. The 200-lb. dressing of ammonium salts, costing about 26s., gives an increase of 8·7 bush. of grain and 9·3 cwt. of straw; the double dressing gives more than double the increase in crop; but three times the dressing does not give three times the crop. When wheat is at 30s. and straw at 20s. the double dressing is the most profitable, giving 1s. more than the return from the largest dressing, without taking into account the saving in the cost of harvesting. When wheat is at 50s., however, and straw at 20s. the case is different: the highest dressing gives 10s. more return than the middle one, which, even after allowing for the extra cost of harvesting, is still profitable.

TABLE IV.—*Influence of increasing Dressings of Nitrogenous Manures on Yield of Wheat, Broadbalk Field; Average of the 61 years 1852-1912.*

	Grain.	Increase per 200 lb. ammonium salts.	Straw.	Increase per 200 lb. ammonium salts.
	Bush.	Bush.	Cwt.	Cwt.
Mineral manure alone ..	14·5	—	12·1	—
Mineral manure + 200 lb. ammonium salts ..	23·2	8·7	21·4	9·3
Mineral manure + 400 lb. ammonium salts ..	32·1	8·9	32·9	11·5
Mineral manure + 600 lb. ammonium salts ..	36·6	4·5	41·1	8·2

*Cost and Value of Increased Produce.**(a) Ordinary circumstances; Wheat at 30s., straw at 20s.*

	Single Dressing.	Double Dressing.	Treble Dressing.
	£ s. d.	£ s. d.	£ s. d.
Value of increase ..	2 1 11	4 6 10	5 11 10
Cost of extra manure ..	1 6 0	2 12 0	3 18 0
Profit on extra manure	0 15 11	1 14 10	1 13 10

*(b) Special circumstances; Wheat at 50s., straw at 20s.*

	Single Dressing.	Double Dressing.	Treble Dressing.
	£ s. d.	£ s. d.	£ s. d.
Value of increase ..	3 3 8	6 10 10	8 7 1
Cost of extra manure ..	1 6 0	2 12 0	3 18 0
Profit on extra manure	1 17 8	3 18 10	4 9 1

The additional cost of harvesting the larger crops is not included, and has still to be deducted from the profits.

Under the special circumstances it will probably be safe to err on the liberal side. A good wheat-grower, with whom the writer discussed the problem, said that he should "think of a good dressing, then double it," and no doubt the underlying principle is sound enough, even though the opinion was not intended to be taken literally.

One cwt. of sulphate of ammonia or nitrate of soda would, in normal circumstances, be considered enough; and this was the amount of nitrate used by Mr. Prout over a long series of years. If the price of wheat keeps high, however, larger dressings might well be used. Too much sulphate of ammonia, however, may cause the crop to lodge and the straw to lose colour, whilst too much nitrate of soda would also cause lodging and might affect the tilth of heavy land.

The dressing of phosphate presents less difficulty. Phosphatic fertilisers have the enormous advantage that no reasonable dressing ever causes injury, while no waste arises, because any excess left over from one season usually lies safely in the soil for the next crop. As a spring dressing for wheat 2 to 4 cwt. of superphosphate could be applied. The general rule is that light soils in dry districts need but little phosphate, if any, for wheat, while heavy soils in wet districts require a good deal.

Fen soils, especially those that lie over clay, and are periodically improved by claying, also respond well to phosphates.

Potash manures are not usually wanted for corn crops, and in any case cannot be got. They are most likely to be needed on light soils where rainfall is low, but on these soils fortunately a dressing of 1 to 2 cwt. of salt usually does all that is requisite.

Safe dressings would probably be as follows :—

*Light soils with less than 24 in. of rain per annum :—*

1 to 2 cwt. of nitrate of soda.

2 cwt. of superphosphate.

2 cwt. of salt.

*Heavy soils with more than 28 in. of rain per annum :—*

1½ to 3 cwt. of nitrate of soda, or if bad tilth is feared, sulphate of ammonia, or 30 bush. of soot.

4 cwt. of superphosphate.

To be applied early in the year.

No general formula can be given for intermediate cases, but the rule is that as the rainfall increases so the need for phosphate increases ; and as the soil becomes heavier more phosphate is required, while sulphate of ammonia should be used in preference to nitrate of soda.

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## THE MANURING OF GRASS LAND.

THAT the proper treatment of grass land in this country is a matter of the greatest importance is evident from the fact that in 1915, as compared with some 10,966,000 acres of arable land, there were nearly 16,088,000 acres under permanent grass, exclusive of 3,765,000 acres of mountain and heath land used for grazing. If the area under clover, sainfoin, and rotation grasses be added to the permanent grass area the total acreage of grass in England and Wales in 1915 amounted to 18,450,000 acres, and the hay crop from that part of this area set apart for hay has averaged 8,000,000 tons in the past ten years.

If it were possible to increase the hay crop alone by only one tenth, this would represent an increase in value of over £2,500,000 on the basis of the valuation used in the Agricultural Census (and disregarding the present exceptional conditions) ; while if the value of the animals, wool, dairy produce and poultry sold off the farms for consumption could be similarly and simultaneously increased by one-tenth, this would, on

the same basis, represent a total increase in value of some £8,300,000.

Quite apart from the present conditions as regards high prices of hay and purchased feeding stuffs and, on the other hand, increased prices of meat and milk, there are, therefore, very good reasons why every effort should be made to increase the productivity of grass land.

At the present time the Board are strongly impressing upon farmers the desirability of bringing more grass under the plough; this, by adding to the demand for store cattle for fattening, furnishes an additional reason for improving the pastures remaining for rearing young stock. It must be pointed out, too, that judicious manuring of grass land has a very favourable effect on tillage crops grown on the broken-up pasture.\*

The definite treatment of fields as either pasture or meadow may be referred to at the outset since it has some bearing on the question of manuring. On soils suited to the really first-class types of grass land, fields should be set aside either as pasture or meadows, the reason being that when a field is under hay and manured accordingly certain strong-growing grasses which go to make a big hay crop are encouraged; when the field is grazed the finer bottom herbage is more suited by the conditions. If the two practices are alternated, encouragement and repression in turn of the several pasture plants occurs, and the best results from neither practice are obtained. On moderate quality pasture and meadow land, however, if repetition of the same practice is continued too long without judicious manuring, deterioration will set in eventually. The value of taking a hay crop from pasture in certain circumstances is referred to later. On the other hand the plants in a field long under hay produce less and less of the best grassy herbage, and as the yield becomes thin the weed plants gain; the herbage of these failing meadows would gradually be improved by continued depasturing.

The effect of manures on herbage is a point that may be further referred to here. Nitrogenous manures stimulate the growth of grasses at the expense of clovers, trefoils, and vetches, while phosphatic and potassic manures lead to an increase in the clovers. In the latter case, however, the land becomes enriched in nitrogen since the leguminous plants

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\* Professor Somerville has shown that the first tillage crop grown on broken-up pasture is likely to be 50 per cent. higher if the pasture has been judiciously treated.

collect the free nitrogen of the air, and this, in turn, reacts on the grasses; so that in a few years there is a marked accumulation of humus, as is evident from the thicker and closer sward.

*N.B.*—For the sake of completeness, various recommendations are made in the following pages with regard to the employment of kainit and sulphate of potash, but probably the only potassic manuring generally practicable at the present time is in the form of guano containing a small percentage of that ingredient.

It is perhaps unnecessary to point out that the supply of plant food in the soil is only one of the factors that determine its fertility; no manures can take the place of a system of draining, or increase the depth of the soil if the latter is badly drained or insufficiently supplied with moisture.

#### *Seeds Hay.*

The manuring of seeds hay is often unnecessary, but if it is decided to undertake manuring the course followed must depend on the character of the plants and the land. Hay on tillage land usually consists of pure clover or a mixture of grass and clover. If clover be absent or very scarce it may be disregarded, and attention be wholly directed to stimulating the grass. In this case nitrogen in some form will be the main fertilising element. Thus, on an ordinary loam or clay, 1 to  $1\frac{1}{2}$  or even 2 cwt. of sulphate of ammonia or nitrate of soda—applied, in the case of the larger dressings, in two doses—will generally suffice. On light and peaty soils, a little superphosphate and kainit (say 2 cwt. of each) may be used. Rotation hay in Scotland, composed largely of rye grasses, has been found to respond particularly well to liquid manure applied at the rate of about 2,000 gal. (9 tons, approximately) per acre.

Where there is a good "take" of clover the nitrogenous dressing must be much curtailed or the clover will be smothered by the luxuriant growth of grass, and the aftermath is likely to be poor. On the other hand, phosphates and potash become of relatively greater importance. With a fair take of clover,  $\frac{3}{4}$ -1 cwt. of sulphate of ammonia or nitrate of soda, 2 cwt. of superphosphate, and 2 cwt. of kainit is likely to prove suitable; while with a strong and abundant clover plant the nitrogenous manure may be reduced by half, or even omitted, while the kainit may be nearly doubled, and the phosphates should be increased by the use of about 3 cwt.

of basic slag applied early in autumn. A slag of high citric solubility is generally to be preferred to one of low solubility, particularly in districts of low rainfall.

Lime may also be conveniently applied to young "seeds" in autumn, after the oat crop has been removed; 10 cwt. per acre of ground lime on light soils and at least 1 ton per acre on heavy soils would be suitable dressings where the land is in need of lime.

*"Seeds" Hay Aftermath.*—Where the "seeds" have not been manured, it may be desirable to top-dress the aftermath. In such cases from  $\frac{1}{2}$  to  $\frac{3}{4}$  cwt. sulphate of ammonia or  $\frac{3}{4}$  to 1 cwt. nitrate of soda, together with 2 cwt. superphosphate, will generally prove suitable.

#### *Meadow Hay.*

When a crop of hay is carted off the farm almost as much plant food is removed from the soil as in the case of a corn crop; hence the need for continuous and liberal manuring if the meadow is to be kept from deteriorating.

To obtain a great bulk of hay the object must be to produce as large a proportion as possible of the larger grasses and clovers, if any, in the herbage.

*Liming.*—Meadow land, especially that in low-lying situations, or on soils of a peaty nature, or that which has been continuously given farmyard manure or sulphate of ammonia, may be in need of liming. Lime may be applied in the form of ground quicklime, slaked lime, or ground limestone, whichever is cheapest, due regard, of course, being paid to the quality of the material. It is not good practice to repeat the dressing too soon, and the improvement resulting from the first application should be followed up by manuring.

*Manurial Treatment.*—Medium grass land under meadow hay should, if possible, get about 10-12 tons of dung per acre applied in autumn. Dung in amounts similar to this applied every year has produced heavy crops on light sandy land at Garforth and on poor clay at Cockle Park, and where dung is plentiful this practice may be usefully followed. Dung, with artificials in alternate years, has proved profitable on both light and heavy soils in practically all experiments carried out on this plan. The artificials used in alternate years have been nitrate of soda only ( $1\frac{1}{2}$  cwt. per acre) or nitrate of soda and superphosphate (2 cwt. per acre) on light soils, or nitrate of soda, superphosphate as above, and kainit (3 cwt. per acre) on both light and heavy soils. Dung applied

every fourth year with artificials in the intervening years has also well repaid the cost of treatment on gravel, loam and clay soils. The artificials used in the intervening years may be  $2\frac{1}{2}$  cwt. of superphosphate or 3 cwt. of basic slag per acre applied in autumn and 1 cwt. of nitrate of soda per acre applied in spring, though in many cases the slag or superphosphate need only be used every second year. These quantities may be reduced if the aftermath is grazed by stock getting cake. Potash manures may also be applied in intervening years (say 2 cwt. kainit, or  $\frac{1}{2}$  cwt. sulphate or muriate of potash per acre), but in general it may be said that the farmer should determine by field trials whether potash should be used, as it is often unnecessary.

The value of liquid manure for meadow hay has been brought out by experiments in Ireland, both in wet and dry seasons. The quantity used has been 16 tons both alone and in combination with artificials. In addition to increased crops of hay the liquid manure induces earlier growth and stimulates the growth of clover. It would probably be best to apply the dressing at different times during the winter months, going over each part of the area two or three times.

*Manurial Treatment without Dung on "Slag" Land.*—Where dung is not available for meadows the treatment should be materially different. If the land is found to respond to basic slag it should get a liberal dressing (up to half a ton per acre) in autumn, and for the next two or three years—that is to say, till the clover begins to fail—nothing more need be given. After that time attention should be given to forcing grass, as distinguished from clover, and this may be done by annually using about 1 cwt. nitrate of soda per acre. After two or three years of such treatment—that is to say, five or six years after applying the slag—the land will again be in a condition to grow clover luxuriantly, when a liberal dressing of slag (say 6–8 cwt. per acre) and 4 cwt. kainit should be given, followed in subsequent years by nitrate of soda as before.

*Manurial Treatment without Dung on other Land.*—If the land is not of the character that responds to slag, the treatment should consist of annual dressings of a general mixture of artificials. Potash and phosphates will increase the leguminous herbage, giving feeding value, while nitrogenous manures will encourage the grasses, producing bulk. Further, a complete dressing of artificials will depress the weeds (a fact which is perhaps to be ascribed to the sulphate of ammonia

and superphosphate), while repeated dressings of dung, only, tend to encourage the coarser grasses and weeds.

In the numerous experiments which have been carried out on the manuring of meadow hay, complete dressings of artificials have given consistently good results on all classes of soil. The quantities used have been : 2-5 cwt. of either superphosphate or basic slag ; 2-3 cwt. of kainit or 1 cwt. of sulphate or muriate of potash ; and about 1-2 cwt. of nitrate of soda or sulphate of ammonia.

As regards incomplete dressings of artificials it is interesting to note, in view of the present dearth of potash, that combinations of nitrate and phosphate have given good results in nearly every experiment where tried.

Manures that contain only nitrogen, however successful at first, if continued, result eventually in deterioration of hay ; the same is often true of manures containing phosphates only.

#### *Pasture.*

*Manuring on Formation of Pasture.*—In forming permanent pastures it will seldom be advisable to apply nitrogenous manures either just before or immediately after sowing the seeds. The first effect of the manuring would be to increase the quantity of straw produced by the corn crop with which the seeds have been sown, and thus to repress rather than aid the young pasture plants. Phosphatic manures, such as basic slag or superphosphate, on the other hand, should be used liberally, and may perhaps be best applied to the preceding root crop. If the root crop has not received either of these artificial manures, one or other may be worked into the land before sowing the seeds. In dry districts and on light soils, 3-5 cwt. of superphosphate should be applied in spring, but for most soils, 4-6 cwt. of basic slag may be recommended. This manure may be applied at any time between November and March, when the soil is in suitable condition. If farmyard manure has been used freely (12-15 tons per acre) for the root crop, and if part of this crop has been consumed on the land, a potash manure may usually be dispensed with ; and even where roots have been carted off, potash manures are not likely to be required before sowing, except on light gravelly, or on light peaty soils.

Six to nine months after sowing the seeds, light soils should receive from 3 to 5 cwt. of superphosphate, and from 2 to 4 cwt. of kainit per acre ; and these manures, in quantities varying with the condition of the herbage, must be repeated at intervals



of from two to three years until the pasture becomes established. Nitrogenous manures may also be employed with advantage under certain conditions, but to use them successfully on pastures, a farmer must be well acquainted with their properties, and their general use is not to be recommended. A dressing of from 7 to 10 tons of farmyard manure two or three years after sowing down a pasture would usually prove very beneficial.

*Established Pastures.*

*Improved Pasture.*—On rich old pastures no nitrogenous manuring will be needed as the soil will become richer in nitrogen every year. Where cake and corn are fed, organic matter has probably accumulated; in such cases, lime and phosphates may be deficient and occasional dressings of ground lime (1 ton per acre) and basic slag (5 cwt. per acre) will therefore be of value.

Much good grass land has slowly deteriorated chiefly as a result of impaired aeration caused by winter puddling by stock; in this case the land should be limed and the toothed harrow used.

*Unimproved Pastures.*—There are large areas of pasture in this country of a kind that experiments and practice alike have shown to be capable of easy and practicable improvement; they can be made to carry double their present stock and each animal will produce much more meat in a grazing season. Examination of the herbage on the best grazing land has shown that it is composed largely of white clover and rye grass and that high quality is associated with a soil rich in available phosphate; experience has shown that the improvement of much inferior pasture may be brought about by phosphatic manuring (sometimes with the addition of potash).

Basic slag usually gives its most striking result when applied to poor pasture on heavy clay soil. The alkalinity of the slag renders it also a very suitable manure for peaty and sour soils. Even very light soils deficient in lime sometimes respond well to an application of slag. The success of basic slag is dependent on a number of well-recognised factors, such as the presence—it may be suppressed—of white clover, and space for the clover or other plant to spread; these conditions usually occur on land covered with bent. A dense turf of miscellaneous herbage militates against the success of basic slag. On poor pastures white clover is usually present, though not apparent, because it may be small and dwarfed. If there is no white clover a little (say 1 lb. of wild white) should be harrowed in in autumn or early spring after manuring.

Basic slag is most suitably applied in autumn or early winter; very good results have, however, followed July application; harrowing the land before applying the slag is sometimes advisable. The slag may be expected to prove more profitable if a large dressing (say  $\frac{1}{2}$  ton) is given at the outset and repeated after six years than if  $\frac{1}{4}$  ton is given at first and a further  $\frac{1}{4}$  ton after three years. The effects of the heavy dressing will be found to last for many years. A repeated dressing of basic slag has, however, a marked effect in some cases, and the productivity of slagged pastures that are showing signs of exhaustion can be quickly improved in this way; the action of a repeated dressing appears to be more rapid in many cases than the action of the first dressing.

Although not so suitable for light soils as for clay, such soils, especially chalky soils, have benefited materially from dressings of basic slag. On light soils, in addition to trying slag alone, the effect of adding kainit when available (at the rate of 3 or 4 cwt. per acre) might be tested. Potash is seldom required on heavy clays, but may be needed just as much as phosphate on light soils.

Only if an "early bite" for lambs or cows in spring is of great importance should nitrogenous manures be given; liquid manure would probably be most suitable for the purpose as it has a less detrimental effect on clover than other nitrogenous manures, but the latest dressing would have to be given some weeks before the stock are to be turned on to the grass so that all trace of the manure and its smell would have had time to disappear. No nitrogenous manures at all should be given at the outset in improving poor pastures by the use of basic slag, nor should cake-feeding be resorted to; nitrogenous manuring in such cases is a bad practice: it tends to encourage the inferior grasses and to suppress what little white clover is present, and the value is never recovered. It is impossible, however, to maintain a purely leguminous herbage, and clovers will partly disappear in the course of three or four years, being replaced by grasses; this is due to the fact that the nitrogen accumulated by the roots encourages the growth of grasses. Further, a mixed herbage is desirable from the grazier's standpoint. From the third or fourth year onwards, therefore, when the slag will probably have produced its maximum effect on the clovers, cake may be given to stock, or dung or artificials supplying nitrogen applied.

A fairly common cause of the failure of basic slag to improve pasture is the closeness or coarseness of the herbage present.

In such cases the following might be tried: (1) Mowing the roughage, followed by a dressing of nitrate of soda, which will encourage cattle to graze the young growth closely; or (2) mowing, followed by close grazing with cattle, and the application of lime in addition to basic slag.

Although inferior to basic slag on the heavier soils, on lighter and drier soils more certain results may be obtained from the use of superphosphate, and under such conditions the addition of kainit, where available, is recommended—say 3 cwt. of superphosphate and 2 or 3 cwt. kainit applied every three years; and if the land is unsuitable for the spread of white clover, cake could be used during the latter part of each season.

*Chalky Soils.*—On some of the Downs a dressing of 8 or 10 cwt. per acre of basic slag has had a most marked effect in improving the herbage. On lesser areas dung, combined with cake-feeding and followed by the use of a complete dressing of artificials, may be recommended.

*Peaty or Moor Soils.*—Soils rich in organic matter respond well to dressings of finely-ground raw mineral phosphate, particularly where the rainfall is abundant. An adequate supply of water, in conjunction with the carbonic acid always occurring in such soils, helps to render the phosphate available for plant growth. Under such conditions ground mineral phosphate is well worth attention at the present time.

It appears that excessive acidity and excessive alkalinity are both destructive of moss. Lime is known to eradicate moss on some soils; superphosphate or basic slag and kainit, particularly the first-named, has also had good effects. "Fogging" is also recommended—*i.e.*, allowing foggage to stand through the autumn for winter grazing; a practice followed in districts with a mild winter—*e.g.*, Wales and S.W. England.

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## NOTES ON BREAKING UP GRASS LAND.

THE preliminary statement on the Agricultural Returns, which will be found on page 596, shows that in the past year farmers have added largely to the area under wheat and oats, but the increase in these corn crops has been secured mainly at the expense of other crops occupying ploughed land; very small additions appear to have been made by ploughing up permanent and rotation grasses.

In the harvest year now beginning, the country expects farmers and farm labourers who have not joined the army to take their share in the burden of war by using their utmost efforts to produce more food; and farmers in most parts of England and Wales, conscious of this duty, are now considering the possibility of ploughing up inferior grass land with the object of increasing its productiveness.

Attention will, in the first instance, doubtless, be given to rotation grass that has been lying out for some years. The tillage of this land should present few difficulties; much of it might at once be prepared for wheat and most of it for oats. In the next place the choice should fall on second-rate grazing land of medium texture. Land of this kind may be profitable enough in a favourable grazing year, but there is much of it, carrying little stock in a cold or dry summer, which would be better ploughed. Again, there are many fields that make unprofitable pastures in dry years because of the lack of a good supply of water for stock. These might now be ploughed up. Light, sandy soils which have been allowed to lie out in grass because too poor to cultivate will next claim attention. The difficulty in dealing satisfactorily with such soils at the present time is the scarcity of artificial potash manures. This restricts the choice of crops. But as soils of this kind are of very small value when under grass, they might be ploughed and sown early in spring with oats, a crop which thrives very well in soils containing little potash. In the south, sandy soils should be ploughed before the end of November and sown before the end of January. The object must be to get the oat crop well established before the end of April, otherwise, should a spell of dry weather set in, the yield will be small. Another method of bringing sandy soils under arable cultivation would be to grow vetches, rape or turnips and consume the crop on the land. Downs with a tolerably deep soil, and adjoining land already in cultivation, might, in some instances, be brought under the plough. In former times the first crops sown on such land were turnips, vetches, or other green crop for sheep-feeding, after which wheat or some other corn crop was taken. Where the surface is flinty or gravelly, the land may be ploughed, pressed and sown with oats.

The most difficult and perhaps the most important class of soil with which the farmer has to deal is the heavy land formerly under wheat, but now producing grass of the poorest quality. This is the type of pasture which, because of the certainty with which it can be improved by the use of basic slag, is

often referred to as "slag" land. The first point that arises in tackling pasture of this description is the drainage. Assuming the old drains to be in working order, and the labour to be available, a proportion of the land might be taken in hand at once; the remainder should get 8-10 cwt. basic slag per acre,\* and should have the drains attended to, with a view to ploughing in a later year if circumstances point to the desirability of putting it again under wheat.

Land that is damp and sour should not be broken up until after it has been drained, but there are many peaty soils growing grass of little value which could be turned into useful arable land if properly drained, limed and manured. Like sandy soils, peaty land usually requires potash.

Damp patches frequently occur in grass fields which are otherwise suitable for breaking. In these cases the broken drains may be repaired during the winter, and the ploughing of the wet land deferred until spring, but the remainder of the field should be ploughed as soon as convenient. The turf in the wet spots, if peaty in character, would not rot well if ploughed in, and under these conditions the practice of paring and burning might be resorted to. There are some grass districts where the practice of paring and burning was once very common, and where it might usefully be revived for the purpose of dealing with a thick, untractable sod. It is carried out as follows: Paring starts in February so that the turf may be exposed to the drying winds of March. On a small scale the turf is pared off by a hand tool, but on a large scale by means of a plough fitted with a winged share. The dried turf should be collected and burnt in small heaps, and directly the heaps are charred through the ashes should be evenly distributed. It is undesirable to wait till the ashes are cold, or combustion will proceed too far and a great proportion of the vegetable matter will be lost. Black ashes are better than red. The fires burn more slowly and require more attention in damp weather, but better ashes are then made. If the land is sticky and close in texture a proportion of the soil may usefully be burnt with the turf, so improving its physical condition and adding to the store of soluble plant food. Further, burning kills plant pests, destroys roots and seeds of weeds, and facilitates the formation of a compact seed-bed so essential for the growth of wheat. The ashes

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\* Very rarely slag has no effect on this type of land because no clover plants are present. If no clover can be detected advice should be sought. (See Special Leaflet No. 25, *Technical Advice for Farmers*.)

should be ploughed under with a shallow furrow, after which the surface should be well harrowed and rolled.

In ploughing up old turf it is essential to cover it well, and at the same time to expose the furrow slice very fully to the air. This may best be done by setting the plough irons so that a crested furrow is formed instead of the usual rectangular furrow. If the crested furrow is thoroughly pressed home, and if the upturned soil is exposed to one or two sharp frosts during the winter, there will be little difficulty in getting a satisfactory seed bed for oats. In the following year the land will be in good condition for potatoes, or a second (manured) oat crop might be taken.

In those parts of the country where a sufficient amount of frost cannot be depended upon, or when for any reason oat-growing may not be desirable, the first crop may be selected from the following list: Potatoes, peas, beans, rape, white mustard, vetches, or a mixture of vetches and corn and, in some cases, turnips. The four last-named crops may be sown broadcast, if necessary, the ground being afterwards lightly chain-harrowed and consolidated by the Cambridge roller. On impoverished land such crops are specially valuable, as they may be fed off with sheep before taking a winter corn crop. White mustard sown in spring will be ready for use in from 6 to 8 weeks, and may be followed by rape, while early-sown rape will afford at least two grazings before late autumn.

Potatoes will do well as a first crop if care be taken to select a strong-growing variety and to get "seed" grown in a northern climate. Under no circumstances can potatoes be grown more cheaply, and with greater freedom from disease, than on a well-managed grass sod. Further, "seed" potatoes from a grass district, particularly an upland grass district, will afford an excellent change for warmer and drier localities.

Peas, whether of the field or garden type, will likewise give a good return on medium or light soils if weeds can be kept in check. Beans alone are uncertain; they frequently make good growth, but are apt to pod badly, and their open habit of growth encourages weeds. As a smother and preparatory crop there is nothing to surpass vetches, which may be sown either in autumn or spring with or without an admixture of corn.

In the foregoing notes the importance of thorough drainage has been referred to. It is further necessary to remember

that land which has for long been left uncultivated and has, in consequence, accumulated considerable stores of organic matter, is almost sure to be deficient in lime. Potatoes and oats are less injured by sourness in the soil than most other crops, but the best results with any crop will be attained only when, by the use of lime, a neutral condition is brought about. Where the land shows indications of sourness moderately large dressings of lime or chalk, say from 1 to 2 tons of the former or 15-20 loads of the latter per acre, should be applied. (See also Leaflet No. 170.—*The Use of Lime in Agriculture*.)

The present deficiency in the supply of artificial potash manures will somewhat restrict the successful cultivation of the lighter soils, but this difficulty may be partially met by growing oats as already suggested; by consuming the first crops on the land along with cake or other concentrated feeding-stuffs, and by dressing with dung or liquid manure where such are available. In this connection readers are referred to an article by Dr. E. J. Russell in this *Journal* for August, 1915, entitled, "How can Crops be Grown without Potash Manures next year?"

All second-rate and inferior grass land broken up for corn should be dressed with  $2\frac{1}{2}$  to 4 cwt. of superphosphate or basic slag per acre when the seed is sown, and, especially on cold, heavy soils and on light, hungry land, a nitrogenous manure in spring would be an advantage.

Further particulars in regard to the cultivation of most of the crops referred to in this leaflet will be found in Special Leaflet No. 28. (*Suggestions for the Cultivation of Catch Crops and Home-Grown Feeding-Stuffs*.)

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## THE WORK OF EDUCATED WOMEN IN HORTICULTURE AND AGRICULTURE.

MRS. ROLAND WILKINS.

THIS report is the outcome of an enquiry conducted on behalf of the Women's Farm and Garden Union, for the purpose of ascertaining what openings exist for educated women to take up some form of agricultural or horticultural work as a profession.

Owing to the war many more educated women than usual are faced with the prospect of having to earn their own living, and amongst them an appreciable number would prefer an outdoor life to a sedentary occupation in a town.

This question is a topical one, and will also remain permanent for this generation. There is at the moment, however, an even more immediate question which is of public interest, and is not confined to the educated class of women, namely, the provision of help to farmers in connection with keeping up the food supply. It is only from women that an increased supply of labour can now be obtained. However acute this question may become during the continuation of the war it is likely to diminish considerably in importance after the war; at the same time it is undoubtedly a question for all time. For instance, it is well known that the woman is an appreciable factor in the success of small holdings, and that a large amount of agricultural work is still done by women in the Northern Counties and in Scotland. The present need for women is simply a development of this. We have heard how much French women have contributed to the sowing and reaping of the harvest in their country: this work of the French women has been, in most cases, not a new work for which they required training, but merely an addition to their ordinary employment.

While confining our attention, therefore, to the possibilities of horticulture and agriculture as a profession for educated women, it is realised that this is a very small part of the big national question with which we are now confronted. It would be interesting to ascertain why in certain counties women still continue to take their place in agricultural work, whereas, in other counties the custom has completely died out. If the war continues long enough, women will undoubtedly play a more important part in such work, but will it continue after the war? What are the advantages of women doing agricultural work (a) to themselves, (b) to the country? These are questions one would like to see answered, but considerable time is needed for such a far-reaching enquiry, and it has been decided to keep this report within the limits of the original intention.

The information given in this report is based entirely on the accumulated evidence collected from a large number of those who have been engaged in the profession for years. Personal visits have been paid to 70 places where women are working holdings of their own; evidence has been received from several hundred women in salaried posts by circularising them with forms. An endeavour has been made to reproduce, without bias or prejudice, in a summarised form, the information and opinions given, and the statements made on many thorny



points must, therefore, not be regarded as merely an expression of personal opinion. The report is confined strictly to the experiences of the past, and no attempt has been made to discuss any of the many new openings which the war may have created.

#### INTRODUCTION.

To what extent have educated women already taken up the work on the land as a profession? In answering this question it is necessary to define very clearly what type of woman is under consideration.

Of the 94,000 females included in the 1911 census as employed in agriculture, 20,000 are under the heading "Farmers and Graziers," and 2,449 are classed as "Market Gardeners."

The majority of these are the female relatives of farmers and market gardeners carrying on their husbands' or fathers' profession, in which they themselves have doubtless been brought up, and with which they have been associated all their lives. Although, in matters of education, numbers of them doubtless merge into the same class as the women under consideration, they do not come within the scope of the present enquiry, which deals with women who, after a secondary education of a superior type, wish to enter this profession from the outside.

It is probable that in all times there have been isolated cases of educated women who have struck out a line for themselves in this direction; but the definite entry of the professional woman into this industry dates from the year 1892, when the foundation of Swanley and later Studley as separate Horticultural Colleges for women afforded opportunities for instruction in horticulture. These colleges were, and are still, largely attended by town girls, and the profession has, undoubtedly, attracted a number of women who, although brought up in different surroundings, prefer an open air life, and find healthy and congenial work as gardeners, or, where capital is available, in setting up for themselves on small holdings, market gardens, fruit farms, poultry farms, etc. The question it is desired to answer is: To what degree have they been successful, and how far are the results encouraging, or otherwise, to those who wish to adopt this career as a profession? An attempt has been made to arrive at an answer by circularising old students, with a view to ascertaining the numbers employed, the rates of pay, the nature of the posts filled, how many have set up for themselves, and under what conditions. A considerable number of those

who have holdings of their own have also been visited. This survey has not been comprehensive, partly owing to the difficulty of tracing old students where no records are kept at the training centres, and partly owing to the limited time in which it was carried out. The particulars given throughout the report should not, therefore, be regarded as the result of a complete and exhaustive enquiry, but only as an indication of the possible results obtainable, as illustrated by the cases of those whose careers have been traced.

The report is divided into parts as follows :—

Part 1.—HORTICULTURE. (a) *Training*: Where to train; length of training; cost. (b) *Results*. Being a survey of the work already accomplished by women.

Part 2.—AGRICULTURE. (a) *Training*. (b) *Prospects*.

Part 3.—GENERAL SUMMARY OF PROSPECTS.

#### I. HORTICULTURE.

##### (a) *Training*.

Whether a woman intends to seek a salaried post as gardener or to set up for herself in a commercial garden, she is entering into competition with men who have probably served their apprenticeship from the age of 14, and have had life-long experience in their profession. The average woman, if she be a complete novice, or even one who has gained some knowledge of gardening in the private garden of her own home, cannot hope in the course of a year or so to be as well qualified as the man who has been doing nothing else all his life. It does not necessarily follow that the educated woman must go through the same long years of apprenticeship to attain the same degree of success; a good, sound, general education and a quicker intelligence will compensate fully for a shorter apprenticeship in early life; but the fact remains that experience in the practical side must be attained through a course of years with varying seasons and varying conditions. The majority of men gardeners get their training in private or commercial gardens, either receiving a low wage as under-gardeners, or as improvers, or, in the case of commercial gardens, paying a premium and receiving a few shillings a week. They can also get instruction at the gardens of the Royal Horticultural Society, and at some of the institutions in connection with County Councils.

In the case of women, they have so far been practically debarred from gaining instruction in commercial gardens, where employers, as a rule, do not care to admit them; it

is possible that these circumstances may alter now that war conditions have necessitated the entry of women into new forms of employment. The consideration of the horticultural training of women raises so many vexed questions, that it is not proposed to enter into it here. One fact, which stands out clearly, is that without lowering the standard of training it is not possible to provide all the kinds of instruction required in one institution. Different types of institution are required according as the object in view is the serious training of women for the colonies, for gardening posts at home, for the training of teachers in gardening, or whether the institution is to form a finishing school.

**Where Training can be Obtained.**—There are three types of training centres for women in horticulture, viz. :—

(A) Collegiate Institutions and County Council Centres.

(B) Gardening Schools.

(C) Various Private and Commercial Gardens run by ladies.

**A. Collegiate Institutions and County Council Centres.**—The object of these institutions is to give a broad, general, horticultural education. Speaking generally, they have a definite staff of lecturers and demonstrators; the theoretical side, as taught in lectures, is as fully developed as the practical; waste, due to the spoiling of plants by the work of inexperienced students, is recognised as a necessary factor in practical instruction, and allowed for at the expense of the commercial side.

**B. Gardening Schools.**—These are of such a varied type that it seems almost impossible to put them together in one class, but, speaking very generally, they are, with one or two exceptions, carried out on a smaller scale than the Collegiate Institutions, both as regards staff and extent. The practical side predominates definitely over the theoretical; where the commercial aspect is a feature, it is less possible to allow students to spoil plants and fruit trees; and each school has its distinct characteristic, whether it be French gardening, colonial training, small holding cultivation, private gardening, nature study, or adaptation to the needs of delicate girls.

**C. Private and Commercial Gardens run by Ladies.**—There is a third type of training centre which merges so closely into some of the smaller institutions of the last category that it is difficult to draw the line between them. These are semi-commercial gardens on a small scale where pupils are taken. No doubt in many cases the advantages to pupil

and employer are mutual, and endeavours are conscientiously made to allow the pupils to practise even though they may do a certain amount of damage. The fact remains, however, that the pupils are there fundamentally to help, by their fees, the financial side of the enterprise; in some cases the training obtained may be well adapted to the pupils' individual requirements, and therefore more suitable than that obtained in a regular institution; in other cases it may be merely a waste of time and money for a girl to be there.

**Deciding where to Train.**—In deciding, therefore, what training centre to attend, a girl should make herself thoroughly acquainted with the exact scope of each place, and consider what it will enable her to undertake at the end of her training. If she can give a definite answer to the following series of questions she will then be in a better position to decide what course of training it is best to adopt, and which place best provides for her individual requirements:—

- (1) What length of training can I afford?
- (2) Do I intend to try it for a short time to see whether I like it or not, or
- (3) Because I have been advised for reasons of health to lead an outdoor life?
- (4) Do I mean to take it up seriously as a profession by which to earn my living, or in order to supplement a small income?
- (5) In this case (4) is it absolutely essential that I should at once begin to earn my living on the completion of 1, 2, or 3 years' training?
- (6) Or shall I have enough to live on while gaining further experience as improver or under-gardener at a low wage?
- (7) Do I want to qualify as a gardener on a large private place, or go as companion gardener on a small place, or work on a commercial garden, or teach gardening?
- (8) Or do I, having a small capital or private income, hope to start an enterprise of my own?

**Length of Training.**—The regular courses of training provided at the larger institutions are from 1 to 3 years in length. It is not advisable to take a course of less than 2 years, but it is questionable whether, if a third year of training is possible, it is not best to take it at some other place, in order to obtain a more varied experience, not only in methods, but of soil and climatic conditions, or to specialise in some particular branch.

The larger part of the failures that have occurred in this profession are due to the fact that students are too apt at the end of a 2 or 3 years' training to think themselves qualified to take up any post that offers itself. Whether this attitude

of mind is due to such a fault in the methods of the teaching that at the end of a course students are unaware of their inexperience, or whether it arises out of the mere optimism of youth, is an arguable point, but the tendency undoubtedly exists, and harm often results. Girls leave these institutions to compete largely with men who have had a life-long practical experience; they would be well advised, if they wish to qualify for the higher posts, to be content to widen their experience and continue their training, by first obtaining posts in good gardens as improvers or under-gardeners at a low wage.

**Age at which to Train.**—It appears to be generally advocated that girls should not begin training too early; they are not as strong at 16 as they are likely to be a few years later, while there is difficulty in placing very young girls over men, or in finding them posts as under-gardeners. The loneliness of the life in many private establishments would also affect young girls more than older women. One woman who was a head-gardener at 20, with three under-gardeners, advises that the training should begin at 17, and the general opinion would confirm this as being the earliest desirable age; many put it as late as 20.

**Cost of Training.**—At the collegiate institutions the fees are from £60 to £150 inclusive (according to whether the accommodation is a cubicle or a study-bedroom), for 3 terms of 13 weeks.

The County Council Centres charge from 10s. to 15s. a week for instruction to non-residents in the county; board and lodging can usually be obtained at about 12s. 6d. a week.

Most of the schools charge 80 guineas inclusive for 3 terms of 13 or 14 weeks. Lower terms can often be arranged by girls sharing rooms. Some of the smaller places, taking a few pupils, charge from 50 guineas inclusive.

The lengths of the terms vary for the inclusive prices; some institutions have three regular terms; others give a month's holiday in the year at different times so that all the pupils are not away at once.

The tabulated statement given on p. 561 shows the principal points concerning the better-known establishments in England taking 10 students or more, as shown in their published prospectuses.

(b) *Results.*

The question whether a girl, after training, has started on an enterprise of her own, or has taken a salaried post,

Name	Date of Establishment.	Extent of Garden in acres.	Horticultural Instructors.	Tuition.	Cost.	Board.	Extras.	Average Number of Students.	Length of Terms.	Length of Full Course.
<b>Colleges.</b>										
Horticultural College, Swanley, Kent	1862	10 garden, 25 fruit.	4 visiting lecturers.	£40	£20 to £200.	—	Dairying, £3 3s. Poultry, £3 3s. Bookkeeping, £2 2s. Teachers' holiday course, £5 5s. (2 weeks).	80	3 terms of 13 weeks.	2 years' diploma, 2 years' certificate
Horticultural College, Studley, Warwickshire	1898	10	5	Short courses, 3d-4 guineas a week.	£150.	—	Bookkeeping, £5 5s. 20 to 60 a term. Laundry, £2 2s. Examination Fee, £1 1s.	20 to 60	3 terms of 13 weeks.	3 years' diploma, 2 years' certificate
University College, Reading	—	1 garden, 11 fruit.	1	£48 to £144 for 40 weeks.	£22 to £42 for 20 weeks.	—	—	13	—	2 years' diploma, 1 year certificate
<b>County Council Centres.</b>										
Bedfordshire Horticultural College, C. C. Farm, Hinton	—	4	2	County Students free, others 10s. a week.	—	—	—	—	—	1 year.
East Anglian School of Agriculture, Chelmsford	1895	3	4 lecturers.	Essex County. Outside lodgings free, others 15s. at 12s. 6d. a week, a week.	—	—	—	15	3 terms of 3 weeks 1 term of 4 weeks	13 weeks. The 4 short courses under 1 year's full course.
<b>Schools taking over 10 pupils.</b>										
St. James' House, Hitchin	1908	4	2	80 guineas.	—	—	—	12	—	2 years.
School of Horticulture, Garden-lane, Clapham, Worthing.	—	3	3	£13 6s. 8d. per term.	£120.	—	Manicures, 5s. a term.	24	—	2 years.
Elmwood Nurseries, Gosham	1902	4½	2	£18 per annum. £60	—	—	—	10	—	—
Glyde College for Lady Gardeners, St. Lewis.	1901-2	5½	1 visiting lecturer.	£20 per annum. About £1 a week	—	—	Expert's lectures compulsory, £6 per annum.	20	1 month's holiday in the year and half holiday a week.	2 years.
Greenway Court, Hollingbourne	—	6 market garden, 1 orchard.	2	80 guineas.	—	—	—	12 to 14	year of 40 weeks.	1-2 years.
St. James' Gardens, West Malvern	1912	15 orchard, 20	2	30 guineas a term. 25 guineas sharing room.	—	—	—	12	3 terms of 13 weeks	2 years.
Devonshire School of Gardening, Tonbridge.	1911	5	3	£18 per annum, 1st year £200, 2nd year £15, 3rd year £10.	From 70 guineas	—	3 guineas a term for those staying under 1 year.	12	3 terms of 13 weeks	2-3 years.
Royal Botanic Gardens, London	—	18	1	Non-residential. Floral decoration	£1 1s.	—	—	—	—	3 years.
French Gardens, Stonehouse	1913	5	2	£6 10s. to £84.	80 guineas.	—	—	10	—	—
Thatcham Fruit and Flower Farm, Newbury.	—	8	4 outside lecturers.	£12 16s. a term.	—	—	—	20	3 terms of 13 weeks.	2 years.

appears to have been mainly a question of capital. Those without private means, who have their living to earn, have had of necessity to adopt the latter course; others, who have had a small sum to invest, or whose parents have been able to start them in a career, occasionally set up for themselves. In almost every case two women have set up together. A brief indication of the general results obtained is given under the two headings "*Own Holdings*" and "*Salaried Posts*."

(i.) OWN HOLDINGS.—Particulars have been obtained of, or visits paid to, 43 women with horticultural holdings. Of the 43:—

- (i.) 18 have various forms of market or nursery gardens;
- (ii.) 8 have small holdings where gardening predominates;
- (iii.) 4 are carrying on the gardens at their homes on a commercial basis;
- (iv.) 3 have jobbing businesses (not connected with nurseries);
- (v.) 4 have private gardening schools (apart from those with a commercial aspect which are included under (i.));
- (vi.) 1 is specialising in seed growing;
- (vii.) 5 have given up owing to want of capital, or through not being successful for want of business habits. Four of these had small market gardens and one had a gardening school.

There are a considerable number of others who live at home and sell the surplus stuff out of their private gardens, or save the cost of keeping a gardener.

**Market and Nursery Gardens.**—This form of holding appears to be the one most generally adopted, but it varies considerably in type. In some the market side predominates, ranging from the growth of the ordinary market crops to specialisation in certain branches only; two women specialised in carnations, one in violets, one in flowers generally, and two went in very largely for French gardening. In others the holding might be worked more as a nursery, and here, again, it might be on general lines, or a special side such as hardy plants, might be developed. In several cases nurseries were combined with a jobbing business and landscape gardening. In others, pupils were taken in sufficiently large numbers to make it worth while developing the educational side, and they were carried on definitely as horticultural schools—where commercial as well as private gardening was taught.

It is not possible, in a short report of this nature, to describe the different types of cultivation adopted, and the technical methods practised. The varying degree of success appeared to bear less relation to the particular branch adopted than it did to

the capacity of the person adopting it. It required common sense, experience, and a business mind to decide what branch was best suited to the given locality, or to choose a locality most suitable for the branch of horticulture to be adopted. For instance, one girl started growing chiefly flowers; but she found that in her neighbourhood there was a universal demand for vegetables, owing to the existence of a large number of houses with small gardens whose owners preferred keeping them as pleasure gardens, and buying vegetables; so she changed her methods to suit these conditions. Another started a market and nursery garden in a district where there was no room for general nursery work, and so took to specialising in certain varieties. Again, those who have not much capital to invest must not choose a type of garden which requires a large amount of glass, or a locality in which the price of land is prohibitive.

*Extent of Holdings, Rent, etc.*—The bulk of the holdings were from 2 to 5 acres in extent. The smallest was 1 acre, and the largest 20 acres. The very small ones were in urban areas, where the price paid for land amounted to building site value; the chief business here would be the sale of hot-house plants, fruit, and cut flowers, and there would be a corresponding amount of glass. The larger holdings were in country districts where land is cheaper, and the cultivation would include more vegetables and fruit.

In quite a number of cases the freehold had been acquired, and sums varying from £85 to £500 an acre paid for it. Where the land was leased the rent was from £1 10s. to £5 an acre. In nearly every case the price paid was for a bare field.

*Disposal of Produce.*—This was nearly always largely on local or private lines. Only those who specialised in particular varieties, or who grew any one crop on an extensive scale, appeared to use Covent Garden and the other wholesale markets to any extent. It was this business side which appeared to be often the stumbling-block. The growing might present no difficulties; but the right thing to grow, and how best to dispose of it, was the chief problem, and that in which mistakes at the outset were most often made.

*Capital Invested.*—A considerable number of holdings have been started with a capital of from £200 to £300, and their owners are living partly on small private incomes. The highest amount in the figures supplied is £1,950, but several successful women had started with from £500 to £1,200, and



one or two are now making an entire living. Some figures have been supplied in answer to a request to be informed of the initial cost of starting in individual cases, and may be useful in giving an idea of the nature of these expenses :—

	£	s.	d.
A.— $3\frac{1}{2}$ acres of land .. .. .	297	10	0
Fencing .. .. .	60	0	0
200 ft. run of glass houses (heated) ..	342	0	0
100 ft. frames (heated) ..			
100 „ (cold) ..			
2 tool and packing sheds .. ..			
Expenses of first two years (largely stock) about	500	0	0
	<u>£1,199 10 0</u>		

The third year the profit was approximately £50 exclusive of living expenses, and apart from the fact that the place was growing in value as the fruit trees developed, etc.

	£
B.—Land and House .. .. .	1,050
3 glass houses, 75 ft. x 12 ft. .. .. }	350
1 glass house, 35 ft. x 20 ft. .. .. }	
Sheds and other sundries .. .. .	50
Working expenses .. .. .	500
	<u>£1,950</u>

During the first two years the produce sold amounted to £335, and the stock on hand at the end of the second year represented a value of £349; wages, coal, stock bought, etc., during this time amounted to £628.

*Examples*—The following are examples of some of the enterprises :—“X” and her two sisters have built up a large nursery business near a town on the South Coast. The eldest sister was trained for two years at a horticultural institution and then taught the two others; one of these had also a year’s work as florist in a commercial nursery in the North. The girls were given £1,000 to start with. They took a 4-acre field and laid it out from the beginning, keeping themselves on the money as well. After two years they made it pay sufficiently to keep themselves entirely with the help of a dress allowance. The £1,000, therefore, was sufficient to set up the three sisters and train two of them. They have now been going 14 years, and have put up 250 ft. of glass, representing an outlay of £420, of which only about £120 came out of the capital.

The business was started as a market garden, but after a few years the sisters worked it on different lines, and gradually

built up a school and nursery. Produce is disposed of in the neighbouring town and a van is kept for the purpose. The nursery stock is mostly used for landscape work undertaken in the autumn, the remainder being sold locally. Besides the nursery work other crops are grown for the instruction of students. Some of the land is planted with all kinds of fruit and sufficient vegetables for purely educational purposes. There is also a small rock garden, a rose garden, and herbaceous borders. The garden, as it is, pays well, apart from the students' fees, and the owners consider it could be made far more profitable as a separate concern if only a few crops were grown.

"Y" had two years' training at a gardening school, and spent one year as improver and marketer. She and her sister then started on a bare acre of land near a small country town in the southern counties. They have now been going 5 years, and possess two fair-sized glass houses, two sheds, about 200 cloches, frames, and garden lights. Half an acre is planted with apples, black currants, and strawberries, and quarter of an acre is devoted to bulbs. They have a few herbaceous plants, and go in largely for rock plants. Under glass they grow chiefly chrysanthemums, tomatoes, and violets.

As the only available capital at the outset was £140, all the stock has been built up out of the actual proceeds of the holding itself during the 5 years, and now represents a capital value of some £600. Board and lodging during this period were provided in return for the care of a smaller private garden adjoining, and the supply of vegetables to a private house. As regards disposal of produce, the chrysanthemums are sold retail locally, and wholesale in a neighbouring town. The tomatoes, of which about 1 ton was grown last year, are sold in local shops. A good private connection has been built up for violets, which do exceedingly well, and of which over 1,000 a day have been picked. The labour has been done almost entirely by the sisters, with the help of one or two occasional students.

*Amount of Success achieved.*—It must be remembered that nearly all these undertakings are the outcome of a training which was only instituted some 13 years ago; very few have been going for more than 7 or 8 years, and a great many only 4 or 5. In almost every case the garden has been made from a bare field, and the initial capital invested has been high,

especially where much glass has been put up. It takes at least three years before the land is fully developed and a connection is established, and it may be much longer with bad seasons, or initial mistakes on the business side.

It is difficult to define precisely the amount of success which has been attained; it is putting it at its highest to say that some are making a living, but not many are making money. The majority are supplementing a small income. At one end of the scale we find a woman, starting with £1,000, who, after 23 years, has trebled the capital entirely out of the proceeds of the holding, and is making a profit on it of 11 per cent. At the other end we find women giving up after two or three years, owing to their having started with insufficient experience and too little capital, the consequence often being a breakdown from over-work and worry. Between these two extremes we find women who have attained varying degrees of success.

*Causes of Success.*—The opinions collected, either from personal visits or by correspondence, are unanimous in regard to the general causes of success and failure. The successes are stated to be due to (1) good health, or (2) good business capacity, or (3) sufficiency of capital, or (4) a thorough training on the practical side. The writer says "or" advisedly, for there have been successes when possibly only one or two of these factors exist—*e.g.*, one of the most successful enterprises was run by a woman who was extremely delicate and unfitted for hard work before taking to an outdoor life, but who has succeeded with a small capital through sheer business capacity. Another very successful woman had had no training, but was strong, and business-like, and lucky in her employees; a good foreman, coupled with her own individual capacity, compensated for her initial lack of knowledge. Many people rely too much on the fact that they have been trained, and do not realise that training does not altogether make up for want of common sense and business habits.

*Causes of Failure.*—The failures are all due to very definite causes, *viz.* :—

1. *Insufficiency of capital*, resulting in not being able to withstand a few bad seasons; in not putting sufficient labour into the land; and in trying to live on the business the first few years before a business connection was established.

2. *Insufficient experience*, a start being made directly after a college training before gaining further experience in the branch of horticulture to be taken up.

3. *Breakdown in health*, which has often been an outcome of the first two causes.

**Small Holdings of the Gardening Type.**—Under this heading have been classed holdings where poultry and bee-keeping are carried on, although gardening may still predominate, especially as regards fruit. The holdings are, as a rule, of a larger acreage than those cultivated solely as gardens, and consist, to some extent, of grass land or grass orchard. Sometimes goats and pigs are added, and perhaps a cow or two, and it becomes more of an agricultural undertaking.

The writer has been much more struck with the possibilities of this type of holding as a suitable occupation for women where capital is limited, than with the purely horticultural type. As the majority show an agricultural bias they will be considered under "Small Holdings," in the second part of the report, which deals with the agricultural side.

**Jobbing Gardening.**—Information has been collected from 28 women who are, or have been, engaged in jobbing gardening in different parts of the country.

Of these, 3 carried it on in connection with their own nursery gardens, and employed men whom they sent out to do the heavier work. They did not make much profit on the men's work, but considered the advantage in combining jobbing with a nursery lay in the advertisement it brought to the latter.

In another case two women ran a very small nursery together, and employed another woman, and they all three went out jobbing at 5s. a day. In and near London those with jobbing businesses employ men and other women, and work themselves, getting their plants from outside nurseries at trade prices. The high price of land would prevent them from having their own nursery unless the business was on a large scale and a large amount of capital was available. Most of the women jobbers in country towns merely work themselves, without employing other labour.

The disadvantages appear to be chiefly the question of remuneration. It is not considered possible to live entirely on the pay; the maximum when starting (in London) will be 7s. 6d.  $\times$  6 = £2 5s. a week. This maximum will be discounted by many blank days, especially in winter, when it is too wet to work. It is, therefore, only suitable for a woman who has her home behind her, or a supplementary income. If she is dependent on the business, a woman has also to be very strong, so as to be able to fulfil her

engagements, and not lose days, or disappoint employers owing to ill-health.

The general opinion appeared to be that there was an opening in jobbing, at any rate in the London district. The women were competing with men who only got from 3s. 6d. to 4s. 6d. a day, but whose standard was often very low, and did not amount to much more than sweeping paths and mowing, whereas the woman jobber always tried to keep the garden bright with flowers. Several women workers advised employing men to do the rougher work, for they did it more quickly and thoroughly, while it paid the woman to devote herself to the floral work, the care of fruit trees, etc.

A few women in the more rural districts had very small gardens, and jobbed, or did landscape gardening as supplementary work.

The rates of pay for a woman working herself were as follows :—

*London and District.*—7s. 6d. to 10s. 6d. a day, according to whether the work was regular or occasional or of the skilled kind, such as pruning.

*Near London.*—5s. to 6s. a day, 7s. 6d. for special work.

*Country Districts.*—3s. 6d. to 5s. a day of 8 hours; tea and occasionally lunch might be added.

A summary of the opinions collected suggests that the advantages of jobbing are the following: That one is more independent than a gardener on a private place; it is a less lonely life, one works daily for different employers, and seems to have more intercourse with them. It is a suitable employment for girls living at home, especially if they are not very strong, and need only a supplementary occupation; in this case they need only arrange for as many days a week as they care about, and if they charge by the hour they need not overtax their strength by working long hours, or do inferior work owing to fatigue.

One woman has made a success of doing a sort of consultant jobbing; she advises girls taking up jobbing to do so as a stepping stone to this, and make themselves proficient in special branches such as fruit work, rose culture, and herbaceous plants. People were very often glad of advice in different subjects, and would pay up to 10s. 6d. a day for it.

**Landscape Gardening.**—This is often undertaken locally by the women who have nurseries; but only one case was found of a woman who called herself a landscape gardener. This lady spent much of her time going to distant places to undertake the laying out of new gardens, or the adaptation of old ones, and made a speciality of garden design.

The following figures have been given in connection with the pay received by various gardeners at different times : 10 per cent. on jobs of which the contract price is up to £250, and 5 per cent. after that ; 30s. a week, board, lodging, and fares ; £2 2s. a week, and fares.

**Gardening Schools.**—A certain number of women who have had horticultural training have started gardening schools, and a few have been very successful, both financially and in the good training they impart. Others, however, may be keeping a financially unsound business going on pupils' labour and pupils' fees—with doubtful benefit to the pupils.

The writer is at the moment regarding schools from the standpoint of an opening as a profession for women, and, therefore, feels bound to state that there is a strong feeling against women setting up more schools at the end of a college training.

There are already schools which owe their origin to considerations other than the horticultural education of women. A limited number of these may be useful if they cater definitely for the woman who is not taking up horticulture seriously as a profession, but who desires an occupation on outdoor lines. Such are, for instance, institutions of another kind which have a large garden, and have adopted this method of turning surplus resources to good account.

Small schools with inadequate teaching facilities run a greater risk than the larger ones of turning out women seeking posts as gardeners who have not had sufficient training, and who tend to lower the reputation for efficiency amongst women gardeners generally.

**Specialists.**—No evidence has been received to show whether many women have attempted specialising in one branch. In the single instance which came under notice, the result was very encouraging. The lady in question had become interested in the Mendelian theory, and started experiments in sweet peas. She began on one acre 12 years ago, and has gradually built up a large seed business on 14 acres of land, with rows of sweet peas totalling over 10 miles in length. At first all the seeds were sold direct to the public, and in course of time a large connection was formed ; now, however, they are all disposed of through one firm ; this means that the winter months are practically a free time from work. No doubt such successful results would not be obtained by all, but there must be other women capable of following the above example.

(Continued.)

## CO-OPERATIVE FARM IMPLEMENT SOCIETIES *(continued)*.

T. WIBBERLEY, N.D.A., N.D.D.,

*Agricultural Expert to the Irish Agricultural Organisation Society.*

### *Agricultural Motors.*

REFERENCE has already been made to the increased difficulties of the tillage farmer in consequence of the war. He has in many instances to contend with a diminished supply of both manual and horse labour, and in these circumstances an account of the working and possibilities of the agricultural tractor, the latest addition to the list of implements purchased by Irish co-operative implement societies will be useful.

Since only about 5 per cent. of the farmers in Ireland have more than 100 statute acres of land it is only very rarely that the individual farmer is in a position to buy an agricultural motor for his sole use. Usually co-operative purchase must be resorted to. The demand amongst the co-operative implement societies is for what may be termed an all-round agricultural motor—an implement which can be used not only for tillage, but for harvesting operations, for working threshing machines and grinding mills, for road haulage, and also in many cases for making land drains. Again, since the average agriculturist has not much mechanical skill, the motor must be "fool-proof." The smaller farmers, also, require a motor, which, speaking generally, can work under the same conditions as a team of horses. On the other hand, the larger farmers usually having comparatively large fields (10 to 20 acres) have found it more economical to purchase a larger type of motor.

An agricultural motor which appears to fulfil most nearly the requirements mentioned above is a tractor made in several sizes varying from 10 to 50 h.p.

Societies consisting of small farmers usually purchase the 10-h.p. model, whilst farmers with larger holdings find the 20-h.p. model best suited to their requirements. In view of their greater weight and size the more powerful motors are not suitable for Irish conditions.

The 10-h.p. model weighs 35 cwt. Like the other models of this type it is built on four wheels and mounted on the three-point suspension principle. This latter feature eliminates to a large extent the strain on the main frame when crossing furrows or doing road haulage work. Roads in rural Ireland are not of the best, and it may be pointed out that, whilst these motors have their front wheels spring-mounted, it would

be very desirable to have springs mounted on the hind wheels if much road haulage is undertaken.

This model is also fitted with a special double-furrow plough, by means of which the driver, unaided, can operate the plough in a very efficient manner. The makers do not guarantee this model to plough more than two furrows at a time, and state that it is more economical for the tractor to plough two furrows at a time than three. This, however, is not the writer's experience. The motor has three forward speeds of 2, 3 and 5 miles per hour. When ploughing two furrows the motor will travel on the second or three mile per hour speed, with one man operating both tractor and plough. In practice, however, it has been found an advantage to have an assistant with the motor driver and to attach another plough (an ordinary horse wheel plough will suffice), drive the motor on the low gear and plough three furrows at a time. Working in this manner more ground can be covered, there is less turning at the headlands, the motor travels at a slower pace, and, in consequence, the ploughing is done in a more efficient manner. Furthermore, if during the day's work anything is required for the motor—fuel, oil, water, etc.—the assistant is available for this purpose; meanwhile the driver may proceed with the two-furrow plough, and thus loss of time is avoided. On any except the very lightest of land this model is not capable of ploughing even two furrows against a gradient of say 1 in 7. Where the gradient is severe it has been found more economical for all the ploughing to be done downhill; the motor then travels against the gradient idle, ploughs down the hill with its own two-furrow plough and, in addition, according to the gradient, pulls an ordinary single or double-furrow plough.

Makers of agricultural motors usually recommend gradients to be ploughed at right angles to the incline, but this is hardly good agricultural practice; the farmer will at once recognise the value of ploughing the land in the same direction as the gradient in order to obtain the maximum surface drainage.

In speaking of ploughing three or four furrows with this small tractor, the English farmer should be careful to note that, as a general rule, only the light or easily-worked land in Ireland is under cultivation. Perhaps the statement that for ploughing work this model has a haulage force equal to that of three draught horses, will give a better idea of the motor's capacity. It might also be pointed out that if this motor is capable of ploughing two or three furrows on stubble or loose land it is also capable of doing the same on similar



land when in lea. This is due to the fact that lea land furnishes a better gripping surface for the driving wheels and thus prevents "back-slip."

For motor work on land a good gripping surface, or in other words a dry condition of the soil, is essential if economical and satisfactory work is to be performed. Most makers—especially those who make light motors—claim that by attaching spuds or grips to the wheels, the land can be cultivated with their motors at any time that the soil is fit for horse work. Such, however, is not the writer's experience, for when working on moist soil—and yet not too moist for horse work—even light motors, fitted with a caterpillar track, slip and consequently suffer great loss of haulage power; while with heavy motors, not only does back-slipping and loss of haulage power result, but also puddling of the soil. It should be understood that the motors referred to are assumed to be hauling their normal loads. Back-slipping and puddling when working on moist soils can be avoided by considerably reducing the normal load; but if this is done the work, in comparison with horse labour, is neither economical nor expeditious.

It may be pointed out, however, that since ploughing or soil cultivation with an agricultural motor can be carried out very expeditiously, tilling of the land under moist conditions can largely be avoided.

*Cost of Motor Ploughing.*—Working with the 10-h.p. motor in the manner indicated above, and ploughing 3 furrows at a time with the assistance of 2 men, 3 statute acres of ploughing per day can be accomplished. The fuel consumption for this amount of work is from  $3\frac{1}{2}$  to 4 gal. of paraffin per acre, and about  $\frac{1}{2}$  gal. of petrol per day. The cost of lubricating oil for the day's work is about 1s. 6d. Leaving depreciation out of consideration, the cost of ploughing 3 acres of land, taking the cost of paraffin and petrol as 8d. and 1s. 3d. per gal., respectively, and the man's and assistant's wages (a boy suffices) as 6s. per day, may therefore be set down as follows:—

	s.	d.
Paraffin, 12 gals. at 8d. per gal. . . . .	8	0
Petrol, $\frac{1}{2}$ gal. at 1s. 3d. per gal. . . . .	0	7 $\frac{1}{2}$
Lubricating Oil . . . . .	1	6
Wages . . . . .	6	0
<hr/>		
Cost of ploughing 3 acres . . . . .	16	1 $\frac{1}{2}$
„ „ 1 acre . . . . .	5	4 $\frac{1}{2}$

It is very difficult to say what charge should be made for depreciation. From the experience which the writer has had

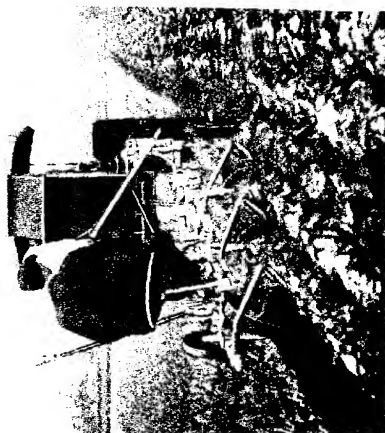


FIG. 1.—Agricultural motor plough, cutting 36 in. wide  $\times$  8 in. deep on wet clay land.

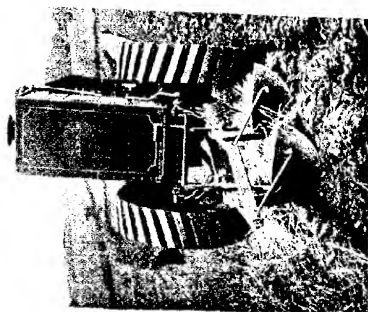


FIG. 2.—Agricultural motor and special 2-furrow plough, operated by the driver. It can also be used to haul a 2-furrow independent plough.



with these motors, there seems no reason why, with ordinary care, they should not last ten years. If such be the case the annual depreciation in the case of the light model would be from £18 to £19, whilst an extra £5 may be allowed to cover the cost of annual repairs. With the 20-h.p. model the fuel and lubricating oil and cost of attendance are comparatively less, and whilst the writer has kept no exact account as to the cost of ploughing with this model, he believes that it will be about 1s. per acre less than when the 10-h.p. type is used. It may be added that, on average Irish soil, the heavier type of machine has no difficulty in ploughing four furrows at a time.

Societies are recommended to hire out their tractors for ploughing at the rate of 10s. per acre to members and 12s. per acre to non-members, the society paying the wages of the driver and bearing the cost of fuel, lubrication, and repairs.

*Motor Engine Threshing.*—It is intended later to give full details of the different sizes and types of threshing machines used by co-operative implement societies. It may here be mentioned that the type of thresher used in combination with the 10-h.p. motor is one with a drum 3 ft. 3 in. long and 24 in. diameter. The drum is of the steel-pegged beater type, with an adjustable concave and having a speed of 720 revolutions per minute. With this thresher driven by the light motor, an average of 1,500 stones (of 14 lb.) of corn can be threshed per day, the corn also being sorted into "firsts" and "seconds," winnowed and bagged ready for sale. The cost of fuel and lubrication for the threshing of this amount of corn is about 10s., and since a charge is made of  $\frac{1}{2}d.$  per stone of corn threshed, the society paying the wages of 2 men only, it will be understood that threshing is the most profitable work from the society's standpoint. The thresher mentioned above weighs 31 cwt., and since the light model tractor can quite easily haul  $2\frac{1}{2}$  tons on the road, the removal of the thresher from farm to farm presents no difficulty.

The 20-h.p. tractor will drive a full-sized threshing machine just as effectively as an ordinary steam threshing engine of 6 nominal horse power. With such a thresher about 2,500 stones of corn can be threshed per day. The fuel consumption for the engine whilst threshing is about  $2\frac{1}{2}$  gal. of paraffin per hour, whilst lubricating oil will cost about 2s. per day. This model is capable of hauling a load of 5 tons, even on Irish roads, so that the transport of the thresher, which weighs from  $3\frac{1}{2}$  to 4 tons, is well within its capacity.

(Continued.)

## NOTES ON FEEDING STUFFS IN SEPTEMBER.

*From the Animal Nutrition Institute, Cambridge University.*

THESE monthly notes have appeared in each number of the *Journal* since March.\* The meaning of food units and other terms, and the methods of calculation, were explained in the first article.

The large table (p. 576) gives the prices of most of the common feeding stuffs at London, Liverpool, Hull and Bristol; also the nutritive ratio and the number of food units per ton. From these figures the price per food unit is calculated and recorded in the last four columns. In most cases the price per ton is about the same in all four markets, but in the case of some feeding stuffs there is considerable variation. For instance, English linseed cake, decorticated cotton cake and American maize are much dearer in Liverpool than elsewhere. The following list of feeding stuffs (see below), arranged according to price per food unit, is compiled from the average prices at all four markets. It shows that prices have advanced all round, as is usual at this time of year when buying for the winter begins. In many cases the increase in price is considerable; for instance, coconut cake, palm-nut kernel cake, linseed cake, cotton cake, and feeding barley have all advanced 2*d.* or more per food unit, or nearly £1 per ton. Earth-nut cake, or as it is often called, ground-nut cake, has been added to the list, and is, at present prices, the cheapest concentrated food on the market. If

### *Average Prices per Food Unit.*

s. d.		s. d.	
Brewers' grains (wet) ..	0 11	Wheat middlings ..	1 9½
Ground nut cake ..	1 3	Linseed cake, Indian ..	1 10½
Maize gluten feed ..	1 4	Maize, American ..	1 11½
Soya bean cake ..	1 5½	Linseed cake, English ..	1 11½
Decorticated cotton cake	1 7½	Maize meal ..	1 11½
Coconut cake ..	1 7½	Beans, Chinese ..	2 0
Maize, Argentine ..	1 7½	Beans, English ..	2 0
Brewers' grains (dried) ..	1 7½	Wheat Sharps ..	2 1
Wheat bran ..	1 7½	Peas, English dun ..	2 2
„ pollards ..	1 7½	Cotton cake, Egyptian ..	2 2½
Maize germ meal ..	1 8½	„ „ Bombay ..	2 4½
Palm-nut kernel cake ..	1 8½	Peas, English maple ..	2 5½
Malt culms ..	1 9	Oats, Argentine ..	2 8½
Rice meal, Burmese ..	1 9½	Peas, Calcutta white ..	2 9
„ „ Egyptian ..	1 9½	Barley, English feeding	2 9½
Wheat bran, broad ..	1 9½	Oats, English ..	3 1½

\* This *Journal*, March, 1915, p. 1111; April, 1915, p. 52; May, 1915, p. 148; June, 1915, p. 248; July, 1915, p. 322; August, 1915, p. 456.

any considerable quantity is available it ought to be of great use to stock feeders during the coming winter. It contains 45 per cent. or rather more of protein (albuminoids), and 7 or 8 per cent. of oil, and is a most valuable feeding stuff for general purposes. A full account of its properties was given in this *Journal* for July, 1915, p. 308, to which readers of these notes who may think of buying ground-nut cake are referred. The writer used it some years ago for fattening bullocks in the winter along with chaff and roots. The bullocks soon got to eat it well, and made satisfactory increases in live weight.

*Suggested Rations for September.*

*Horses.*—Horses will be getting back to winter rations. With oats at their present prohibitive price the following rations may be used, variations being made as suggested in former notes to meet special cases of extra large or smaller horses and extra hard work: 4 lb. crushed maize, 2 lb. bran, 2 lb. beans or  $1\frac{1}{2}$  lb. ground-nut cake, and 2 lb. dried grains.

If the supply of hay is short, and straw forms the greater part of the "bulky fodder," the ration should be altered thus: 4 lb. crushed maize, 4 lb. bran, 2 lb. beans or  $1\frac{1}{2}$  lb. ground-nut cake, and 2 lb. linseed cake.

Instead of using linseed cake in this ration, crushed or ground linseed at the rate of 1 lb. per head per day may be boiled in water until it jellies, and then be used to damp the straw chaff, which, when treated in this way, is an efficient substitute for hay.

*Milking Cows.*—After the recent spell of cold showery weather the autumn grass will be wet and inclined to cause scouring. In these circumstances it may be wise to alter last month's rations by the addition of 1 lb. per head per day of cotton cake, because of its binding properties. The following rations are suggested: 1 part cotton cake, 1 part crushed maize, 1 part bran, and 1 part coconut cake; or 1 part cotton cake, 1 part maize gluten feed, and 1 part bran.

At present prices cotton cake is an extravagant feeding stuff to buy, and is only recommended as a reliable antidote to the wateriness of autumn grass. Ground-nut cake is said to have binding properties and to be a safe food for milking cows. Although the writer has no personal experience of using it for this purpose, it is so cheap at the present price that he has no hesitation in suggesting the following rations: 2 parts ground-nut cake, and 2 parts maize; or 1 part ground-nut cake, 1 part coconut cake, 1 part maize, and 1 part bran;

Feeding Stuff.	Reckoned from digestible nutrients.		Approximate prices per ton at the end of August.				Approximate prices per Food Unit.			
	Nutritive Ratio.	Food Units.	Approximate prices per ton at the end of August.				Approximate prices per Food Unit.			
			London.	Liverpool.	Hull.	Bristol.	London.	Liverpool.	Hull.	Bristol.
Soya Bean Cake ..	1:1.7	122.3	£ 9 10 0	£ 8 10 0	£ 9 0 0	£ 8 10 0	£ 1 6 1	£ 1 9 0	£ 1 5 1	£ 1 7 0
Deodorized Cotton Cake ..	1:1.7	125.3	£ 11 11 3	£ 11 5 0	£ 11 7 6	£ 11 17 6	£ 1 10 1	£ 1 10 0	£ 1 11 0	£ 1 12 0
Indian Linseed Cake ..	1:1.9	120.1	£ 11 12 6	£ 12 5 0	£ 11 7 6	£ 11 17 6	£ 1 11 1	£ 1 11 0	£ 1 11 0	£ 1 12 0
English Linseed Cake ..	1:2.0	120.1	£ 11 12 6	£ 12 5 0	£ 11 7 6	£ 11 17 6	£ 1 11 1	£ 1 11 0	£ 1 11 0	£ 1 12 0
English Cotton Cake ..	1:2.4	121.9	£ 7 13 0	£ 8 0 0	£ 8 0 0	£ 8 10 0	£ 1 6 1	£ 1 6 1	£ 1 6 1	£ 1 6 1
Erabean Cotton Cake ..	1:2.8	126.6	£ 8 1 3	£ 8 5 0	£ 8 0 0	£ 8 10 0	£ 1 6 1	£ 1 6 1	£ 1 6 1	£ 1 6 1
Coconut Cake ..	1:3.8	162.6	£ 7 7 6	£ 6 15 0	£ 7 0 0	£ 7 10 0	£ 1 7 1	£ 1 7 1	£ 1 7 1	£ 1 7 1
Palm-nut Kernel Cake ..	1:4.0	83.5	£ 7 7 6	£ 6 15 0	£ 7 0 0	£ 7 10 0	£ 1 7 1	£ 1 7 1	£ 1 7 1	£ 1 7 1
Groundnut Cake ..	1:4.0	140.5	£ 7 7 6	£ 6 15 0	£ 7 0 0	£ 7 10 0	£ 1 7 1	£ 1 7 1	£ 1 7 1	£ 1 7 1
English Beans ..	1:9.0	167.5	£ 9 13 8	£ 10 10 0	£ 9 5 0	£ 9 17 11	£ 1 11 1	£ 1 11 1	£ 1 11 1	£ 1 11 1
Chinese Beans ..	1:2.6	167.2	£ 12 4 5	£ 10 5 4	£ 9 5 0	£ 9 17 11	£ 2 0 1	£ 2 0 1	£ 2 0 1	£ 2 0 1
English Maple Peas ..	1:3.2	57.2	£ 12 4 5	£ 10 5 4	£ 9 5 0	£ 9 17 11	£ 2 0 1	£ 2 0 1	£ 2 0 1	£ 2 0 1
English White Peas ..	1:3.2	97.5	£ 11 11 1	£ 10 5 4	£ 9 5 0	£ 9 17 11	£ 2 0 1	£ 2 0 1	£ 2 0 1	£ 2 0 1
English White Peas ..	1:3.2	97.5	£ 11 11 1	£ 10 5 4	£ 9 5 0	£ 9 17 11	£ 2 0 1	£ 2 0 1	£ 2 0 1	£ 2 0 1
American Maize ..	1:1.1	93.8	£ 8 5 8	£ 9 19 9	£ 7 9 4	£ 7 11 8	£ 1 9 1	£ 1 9 1	£ 1 9 1	£ 1 9 1
Argentine Maize ..	1:1.1	94.2	£ 7 12 10	£ 2 10 3	£ 8 5 0	£ 8 10 0	£ 1 7 1	£ 1 7 1	£ 1 7 1	£ 1 7 1
Maize (Feed) ..	1:1.3	129.6	£ 8 7 6	£ 8 5 0	£ 8 5 0	£ 8 10 0	£ 1 8 1	£ 1 8 1	£ 1 8 1	£ 1 8 1
Maize Germ Meal ..	1:1.3	99.2	£ 8 7 6	£ 8 5 0	£ 8 5 0	£ 8 10 0	£ 1 8 1	£ 1 8 1	£ 1 8 1	£ 1 8 1
English Feeding Barley ..	1:2.8	83.0	£ 11 0 7	£ 11 10 5	£ 11 4 0	£ 11 15 2	£ 2 9 1	£ 2 9 1	£ 2 9 1	£ 2 9 1
English Oats ..	1:2.9	75.4	£ 12 18 1	£ 11 10 5	£ 10 3 8	£ 10 13 8	£ 3 7 1	£ 3 7 1	£ 3 7 1	£ 3 7 1
English Oats ..	1:3.6	69.9	£ 6 0 0	£ 6 15 0	£ 5 10 0	£ 5 10 0	£ 1 11 1	£ 1 11 1	£ 1 11 1	£ 1 11 1
Malt Culls ..	1:3.4	84.5	£ 6 17 6	£ 6 15 0	£ 5 10 0	£ 5 10 0	£ 1 11 1	£ 1 11 1	£ 1 11 1	£ 1 11 1
Brewers' Grains (dried) ..	1:3.4	84.5	£ 6 17 6	£ 6 15 0	£ 5 10 0	£ 5 10 0	£ 1 11 1	£ 1 11 1	£ 1 11 1	£ 1 11 1
Brewers' Grains (wet) ..	1:3.4	84.5	£ 6 17 6	£ 6 15 0	£ 5 10 0	£ 5 10 0	£ 1 11 1	£ 1 11 1	£ 1 11 1	£ 1 11 1
Egyptian Rice Meal ..	1:10.3	28.7	£ 7 0 0	£ 7 5 0	£ 6 12 6	£ 7 5 0	£ 1 9 1	£ 1 9 1	£ 1 9 1	£ 1 9 1
Burmese Rice Meal ..	1:10.3	28.7	£ 6 15 0	£ 7 5 0	£ 6 12 6	£ 7 5 0	£ 1 9 1	£ 1 9 1	£ 1 9 1	£ 1 9 1
Wheat Middlings ..	1:5.3	93.4	£ 8 19 0	£ 9 5 0	£ 7 5 0	£ 8 10 0	£ 2 0 1	£ 2 0 1	£ 2 0 1	£ 2 0 1
Wheat Pollards ..	1:5.3	81.0	£ 8 19 0	£ 9 5 0	£ 7 5 0	£ 8 10 0	£ 2 0 1	£ 2 0 1	£ 2 0 1	£ 2 0 1
Wheat Bran ..	1:5.3	77.5	£ 6 5 0	£ 6 10 0	£ 6 0 0	£ 6 10 0	£ 1 7 1	£ 1 7 1	£ 1 7 1	£ 1 7 1
Wheat Bran (ground) ..	1:4.7	79.9	£ 7 5 0	£ 7 2 6	£ 7 0 0	£ 7 5 0	£ 1 9 1	£ 1 9 1	£ 1 9 1	£ 1 9 1

The prices quoted for English feeding barley, English oats and English beans are for last year's crop. The London prices for new season's crop, early September delivery, of English feeding barley, oats and peas are about 3s. lower than those quoted. The quotation for soya bean at Liverpool is for meat not cake.

or 1 part ground-nut cake, 1 part maize gluten feed, and 1 part bran.

In using all these mixtures, the ration should vary according to the yield of milk. All cows should get 3 lb. per head per day, *i.e.*, rather more than was recommended last month, as the grass is likely to be of lower nutritive value. Cows giving more than 2 gal. of milk per day should get an extra pound per day for each extra gallon.

*Baby Beef.*—Calves 8 to 10 months old which are to be brought out fat at 12 to 16 months should be pushed on, and may be given 4 to 6 lb. per head per day of some such mixture as the following: 1 part linseed cake, 1 part ground-nut cake, 1 part maize, and 1 part rice meal.

If plenty of turnips are available a suitable mixture is: 1 part linseed cake, 1 part maize germ meal, and 2 parts coconut cake.

Young stock do not take to ground-nut cake readily, and it is bad practice to check their progress by giving them food they do not like. By taking some trouble to introduce it little by little into their ration ground-nut cake may gradually be substituted for linseed cake in the above mixture, with very considerable economy.

*Beef on aftermath.*—The following rations are suggested for moderately fresh stores about 20 months old, weighing about 8 cwt. live weight: 1 lb. linseed cake, 1 lb. cotton cake, and 1 lb. coconut cake.

As their weight goes up the coconut cake may be increased up to as much as 4 lb. per head per day. Again it should be noted that at present prices cotton cake is an extravagant food, but necessary to prevent scouring on watery aftermath.

A more economical ration would be: 1 lb. linseed cake, 1 lb. ground-nut cake, and 1 lb. coconut cake. This should be satisfactory if the ground-nut cake possesses the binding properties with which it is credited. As before, the ration should be increased as the animals get heavier until the ground-nut cake and the coconut cake amount to 2 lb. of each per head per day. If the animals eat the ground-nut and coconut cakes readily the dearer linseed cake may be dropped. If signs of scouring appear, a little cotton cake should be added to the ration, in spite of its high price per food unit.

*Beef in Yards on Roots and Chaff.*—The following treatment may be suggested for 2-year-olds of about 8 cwt. live weight to come out fat during the winter or early spring. Along with their ordinary ration of roots and chaff the cheapest concen-



trated food to use at present prices is ground-nut cake. A start should be made with a small allowance of, say, 2 lb. per head per day. As soon as this is eaten readily the allowance may be increased until at the end of about 12 weeks the ration reaches 6 lb. per head per day. For the next month or so a small extra ration of, say, 3 or 4 lb. per head per day of a mixture of linseed cake and bean meal may be given in addition to the ground-nut cake to put a "finish" on the animals. At the present high price of feeding stuffs this is as far as it is profitable to go. A further month with more linseed cake and bean meal will put on a higher-class finish, but the increase in weight will be small and the cost of the extra feeding very great. Reasonably well-finished animals nowadays command such good prices that it is likely to pay best and to be most economical of food to rest satisfied as soon as the rate of increase in live weight gets slow, and, with the feeding suggested above, this will probably be in about 16 weeks.

*Sheep.*—For *ewes going with the ram* a safe and reasonably economical ration is about  $\frac{1}{2}$  lb. per head per day of a mixture of equal quantities of linseed cake and dried grains. The ration should vary with the size of the ewes and the quality of the fold or pasture.

For *Hogs or Togs* folded on rape, mustard, cabbage or turnips, from  $\frac{1}{2}$  to 1 lb. per head per day, according to size, of one of the following mixtures may be fed: 1 part coconut cake, 1 part maize meal or crushed maize, 1 part maize germ meal, and 1 part rice meal; or 1 part dried grains, 1 part maize meal or crushed maize, and 1 part bran; or 1 part decorticated cotton cake, and 1 part maize meal or crushed maize; or 1 part decorticated cotton cake, and 1 part rice meal.

If no hay chaff is available and the sheep are so forward as to refuse straw chaff,  $\frac{1}{4}$  lb. of bran per head per day should be added to the above rations.

The writer has no experience of ground-nut cake for sheep, but the price may tempt farmers to use it, in which case it is suggested that ground-nut cake may be gradually worked into the above rations in place of decorticated cotton cake.

*Pigs.*—The following mixtures may be suggested as substitutes for barley meal, the price of which is still prohibitive: 4 parts maize meal, 1 part ground-nut cake or palm-nut cake, and 2 parts sharps; or 2 parts maize meal, 2 parts rice meal, 1 part coconut cake or palm-nut cake, and 1 part bean meal; or 2 parts rice meal, 2 parts maize germ meal, and 1 part coconut cake or palm-nut cake; or 2 parts maize meal, 2 parts rice meal, and 1 part ground-nut cake.

Cases have recently been come across of fat hogs breaking their hind legs after being fed for some time exclusively on rice meal. Rice meal and maize meal make excellent pig foods if supplemented with other foods rich in protein and ash constituents, such as those suggested above. Cases also occur of the other extreme, where pigs have been fed exclusively on cheap cake, which is not to be recommended, though for other reasons.

### IMPORTS OF GRAIN IN THE CEREAL YEAR 1914-15.

THE effect of the war on our supplies of grain may conveniently be considered at the end of the cereal year (1st September to 31st August), at which date it is possible to ascertain the extent to which imports of grain from our Colonies and from foreign countries have supplemented the home harvest of 1914.

The imports of *wheat* into the United Kingdom amounted to 22,483,587 qr. (of 480 lb.), these being less by 783,588 qr. than the imports of 1913-14 and by 4,016,978 qr. than the imports of 1912-13. Including the produce of the home wheat crop of 1914, and converting the imported flour into an equivalent quantity of wheat, the total quantity of wheat available for consumption in the United Kingdom was 33,817,000 qr. compared with 34,008,000 qr. in 1913-14 and 37,325,000 qr. in 1912-13. In these amounts seed is included, but not stocks carried over. Similar figures for recent years are given in the following table :—

Harvest Year.	Wheat Crop of the United Kingdom.	Imports of Wheat during the Cereal Year, Sept. 1—Aug. 31.	Imports of Wheat Flour in equivalent Weight of Grain.	Total Imported Wheat and Flour in equivalent Weight of Grain.	Total estimated Wheat Grain available for Home Consumption (including seed)
	qr.	qr.	qr.	qr.	qr.
1905-6 ..	7,541,600	22,063,580	4,677,330	26,749,010	34,282,510
1906-7 ..	7,577,300	22,105,180	4,284,490	26,389,670	33,966,970
1907-8 ..	7,066,400	21,362,720	4,339,090	25,701,810	34,768,210
1908-9 ..	6,741,200	21,727,220	3,554,650	25,281,870	32,023,070
1909-10 ..	7,899,000	24,090,060	3,501,520	27,600,580	35,500,180
1910-11 ..	7,074,200	23,516,140	3,263,380	26,779,520	33,853,720
1911-12 ..	8,039,200	24,100,260	3,324,140	27,433,400	35,472,600
1912-13 ..	7,175,300	26,500,505	3,648,883	30,149,450	37,324,750
1913-14 ..	7,087,100	23,267,175	3,654,048	26,921,220	34,008,320
1914-15 ..	7,804,000	22,483,587	3,529,573	26,013,160	33,817,160

Compared with the previous cereal year, therefore, the decrease in the imports was practically counter-balanced by the increase in the home wheat harvest, and the total estimated grain available for home consumption in 1914-15 fell short of that in 1913-14 only by the very small amount of 0·6 per cent.

With regard to the countries from which the supply of wheat was drawn, the receipts from each of the principal sources of imported wheat are given below :—

Country of Export.	Thousands of cwt.			
	1914-15.	1913-14.	1912-13.	1911-12.
India .. .. .	16,018	11,477	23,152	21,468
Russia .. .. .	635	9,566	7,379	8,520
Argentina .. .. .	12,175	6,991	18,617	16,823
United States .. .. .	40,806	30,496	31,569	16,619
Canada .. .. .	25,159	24,977	21,249	19,819
Australia .. .. .	1,297	14,300	9,738	15,170

The year's wheat trade was marked by the large decreases in the imports from Australia and Russia, the other chief countries of supply all sending us increased quantities. This is now the third year in succession in which the United States has been the chief source of our imported wheat supply, which is all the more remarkable in that, for the four years prior to 1911-12, there was a continuous decrease in the imports from that country; the quantity imported from the United States in 1914-15 (40,806,000 cwt.) is larger than in any year since 1901-2 (41,584,000 cwt.). The receipts from Canada in the last five years show a steady increase, those in 1914-15 (25,159,000 cwt.) being again the largest yet recorded from that country.

The price of home-grown wheat rose from an average of 32s. 4d. in 1913-14 to 49s. 9d. in 1914-15. During the year there was in general a rise from 36s. 5d. in September, 1914, to 62s. towards the end of May, 1915, somewhat lower prices being returned after that date, and the price at the end of the cereal year being 51s. 11d. per qr. The average declared value of imported wheat rose from 34s. 7½d. in 1913-14 to 50s. 10d. in 1914-15, *i.e.*, a rise of 47 per cent. (as compared with a rise in price of 54 per cent. for home-grown wheat). The average declared value of imported wheat in previous years was 36s. 2d. per qr. in 1912-13, 35s. 11d. in 1911-12, 33s. 10d. in 1910-11, and 37s. 5d. in 1909-10.

English barley averaged 32s. 6d. per qr. (a rise of 5s. 8d. compared with the preceding year), while English oats averaged 28s. 8d. (a rise of 9s. 7d.). The value of imported barley was 29s. 7d. per qr., and of imported oats 29s. 5½d. per qr., compared with 24s. 1½d. and 16s. 7d., respectively, in the previous year. It is worthy of note that while English oats rose in price by 50 per cent., imported oats rose by as much as 78 per cent.

The following table shows the average prices of British wheat, barley and oats ascertained under the Corn Returns Act in each of the cereal years since 1905-6. The quantities given in the table are the quantities returned as sold, from which the averages are calculated :—

*Average price of British wheat, barley, and oats ascertained under the Corn Returns Act in each cereal year since 1905-6.*

Harvest years. Sept. 1— Aug. 31.	Prices per quarter.			Quantities sold at certain markets.		
	Wheat.	Barley.	Oats.	Wheat.	Barley.	Oats.
	s. d.	s. d.	s. d.	Quarters.	Quarters.	Quarters.
1905-06	28 9	24 2	18 5	2,910,263	3,202,613	910,015
1906-07	28 1	24 5	18 4	2,830,991	3,376,615	1,219,410
1907-08	32 9	25 8	18 2	2,944,256	3,504,908	1,530,848
1908-09	36 6	26 11	18 10	2,902,825	2,972,889	1,954,318
1909-10	32 6	23 10	17 8	3,144,873	2,988,483	795,824
1910-11	30 11	24 9	17 8	2,799,763	2,992,128	831,898
1911-12	34 10	31 2	21 6	2,944,995	2,645,477	719,495
1912-13	32 0	27 10	19 7	2,324,474	2,489,932	630,270
1913-14	32 4	26 10	19 1	2,746,702	3,438,159	850,308
1914-15	49 9	32 6	28 8	3,164,978	3,132,773	1,244,495

The aggregate imports of the principal cereals in each of the past ten years are given below :—

The past ten years are given.						
Millions of cwt.						
Harvest Year.		Wheat.	Wheat Meal and Flour.	Barley.	Oats.	Maize.
1905-6	..	94.6	14.4	20.3	16.0	47.1
1906-7	..	94.7	13.2	19.5	10.9	51.7
1907-8	..	91.6	13.4	17.5	13.2	39.5
1908-9	..	93.1	11.0	22.0	15.5	39.0
1909-10	..	103.3	10.8	19.9	19.0	34.6
1910-11	..	100.8	10.1	20.1	16.6	40.0
1911-12	..	103.3	10.3	21.9	18.4	32.1
1912-13	..	113.6	11.3	22.4	20.0	49.5
1913-14	..	99.7	11.3	21.2	15.4	40.2
1914-15	..	96.4	10.9	12.7	15.4	48.0

Thus, although imports of wheat, wheat meal and flour, and barley declined, there was no fall in the imports of oats, and we received nearly eight million cwt. more maize in 1914-15 than in 1913-14. The increased supplies of maize were due to an increase of 12 million cwt. on the imports from Argentina in 1914-15 as compared with those of 1913-14.

### WINTER OATS.

WHILE endeavouring to increase the area under wheat, farmers should arrange, if possible, not to reduce the area under oats, for, to a nation at war, this grain may be just as useful as wheat, and the straw is of special value as fodder for stock. In many districts, particularly in the south of England, repeated attacks by frit-fly (sometimes called "bottling") have rendered spring oats a precarious crop. Winter-sown oats, however, are less liable to attack by this pest, and might, therefore, receive increased attention at the present time. They are also better adapted than spring oats for land badly infested with charlock.

*Varieties of Winter Oats.*—Two varieties are commonly grown, namely, Winter Grey or Dun Oat, and Winter Black Oat. In deciding which to grow, farmers should be guided largely by local experience, for while both may grow equally well in any particular district, there is sometimes a keener local demand by merchants for one than for the other. The black variety possesses somewhat stronger straw than the grey, and might generally be given the preference on land subject to "lodging." It is more liable to shed its seed than the grey variety, and should be cut before it is dead ripe. In neither case is the straw so palatable as that of the finer spring varieties, but when chaffed and mixed with cake and meal it is readily eaten by stock.

*Soil and Cultivation.*—Winter Oats are suited to a wide range of soils. They can be grown successfully on soils too light or too poor for wheat, and they prevent such soils from "washing" in a wet winter. Further, they can be taken as a second corn crop, provided the land is clean. They are not so hardy as winter wheat or winter barley, and consequently must be sown earlier, preferably in September, so that the plants may become well established before cold weather sets in. The ground should be left somewhat rough as a protection against cold winds; and with this object in view it is customary in some districts not to harrow after drilling.

Unless the land is thoroughly clean, weeds, favoured by a longer growing period than usual, may seriously reduce the crop.

About 3 to 4 bush. per acre should be sown; the earlier the sowing and the cleaner the land the less the quantity of seed necessary.

Winter oats often contain seeds of a Brome Grass (*Bromus secalinus*), a troublesome weed on light land; purchasers should see that seed oats have been carefully cleaned.

Winter oats are best suited to the warmer southern counties, and are generally ready for cutting from ten days to a fortnight before other corn crops. This enables the land to be prepared sooner for the following crop, a point of some importance when farming is conducted at high pressure. On the other hand, the earlier ripening is a disadvantage near towns where birds are numerous.

## ECONOMY IN FOOD.

### APPEAL TO COUNTRY PEOPLE.

#### Produce Food for Yourself!

*Everyone* who lives in the country or has a garden can produce *something* to eat—the more the better: vegetables, fruit, poultry, eggs, rabbits, milk, cheese. Plant at once what you can, and prepare in all possible ways for next year's cropping!

#### Every Plant in your Garden may Save you Money!

Produce all you can; buy as little as possible! Cultivate thoroughly! Destroy insect pests and weeds! Prepare manure!

#### Preserve and Store your Crops with the Greatest Care!

The finest harvesting may be rendered useless by bad storing. Protect from the weather! Destroy vermin! Store your own vegetables! Bottle your fruit or make jam or pulp of it! Preserve your eggs when abundant! Cure your own bacon!

#### Eat Little Meat!

Replace meat by milk, cheese, peas, beans and lentils, which are as rich in flesh-formers as meat, and much cheaper. Use more vegetables! Eat more fruit!

#### Bake your own Bread: It will be Cheaper and Better!

Use whole-meal flour from home-grown wheat, barley and oats. Good, wholesome bread can be made from:—

- (1) Household flour, or wholemeal flour.
- (2)  $\frac{1}{2}$  Household flour and  $\frac{1}{2}$  barley meal.
- (3)  $\frac{7}{8}$  Whole-meal flour and  $\frac{1}{8}$  fine oatmeal.
- (4)  $\frac{4}{5}$  Whole-meal flour and  $\frac{1}{5}$  maize meal.

- (5)  $\frac{3}{4}$  Household flour and  $\frac{1}{4}$  boiled potatoes.
- (6) Oatmeal.
- (7) Barley meal.

**Cook Vegetables by Steaming!**

Boiling in water reduces their food value! Cook potatoes in their skins! *Use the Hay-box Cooker* (see notice below): it will save coal.

**Use Less Coal!**

Burn wood, peat, etc., whenever possible!

**Save Fodder!**

Use acorns, chestnuts and beech-mast for stock; bracken for litter; all suitable straw for fodder; fodder crops for pigs! Keep pigs, poultry or rabbits to eat up house refuse, damaged vegetables, light corn!

**Waste Nothing!**

Buy nothing from abroad that can be produced at home!

For suggestions as to these things read the Board's leaflets. See note below.

**READ THIS: IT CONCERNS YOU.**

The following short list of pamphlets and leaflets should be read by all who live in the country or have a garden. Read them and follow the advice given!

**Economy in Food** (Circular 917): Obtainable on application to the Board of Education, Whitehall, London, S.W. Price 1d. post free.

**How to Save and Why:** Obtainable free on application to The Parliamentary War Savings Committee, 12, Downing Street, London, S.W.

**Saving the Food of the Nation:** Obtainable free on application to the National Food Fund (Educational Campaign), 1A, Dover Street, Piccadilly, London, W.

**Hints on Hay-box Cookery:** Obtainable free on application to the National Food Fund (Educational Campaign), 1A, Dover Street, Piccadilly, London, W.

**Various Leaflets:** About 320 leaflets to help do what is suggested above have been issued by the Board of Agriculture and Fisheries.

*Any of the Board's leaflets can be obtained gratis and post free on application to the Secretary, Board of Agriculture and Fisheries, Whitehall Place, London, S.W. Send an unstamped postcard for those you would like and a list of all the Board's publications.*

THE President of the Board of Agriculture and Fisheries appointed on 17th June last a Departmental Committee "to consider and report what steps should be taken, by legislation or otherwise, for the sole purpose of maintaining and, if possible, increasing the present production of food in England and Wales, on the assumption that the war may be prolonged beyond the harvest of 1916." The appointment of this Committee was followed by that of committees for Scotland and Ireland with the same terms of reference. The Interim Report of the Committee for England and Wales, of which Viscount Milner is the Chairman, dated the 17th July, has now been published, as well as the Reports of the Scottish and Irish Committees.

The President of the Board of Agriculture and Fisheries in the speech printed on p. 489 announced the Government's decision respecting the English Committee's recommendations.

*Report of the Committee for England and Wales.*

It did not appear to the Committee to be within the terms of their reference to enquire, nor did they as a matter of fact enquire, into the nature and extent of the danger threatening our imported food supplies. But they state that if in the opinion of the Government, which is alone competent to judge of this question, an emergency is likely to exist after the harvest of next year which calls for the adoption of exceptional measures at the present time, there are certain steps, only effective if taken immediately, to which the Committee felt bound to direct attention.

*Guaranteed Minimum Price for Wheat.*—The Committee's first recommendation is that a minimum price of 45s. a qr. should be guaranteed for all marketable home-grown wheat for a period of four years. It is recommended that any payment to the farmer under the suggested guarantee should be regulated by the difference between 45s. and the "Gazette" average price of wheat for the year in which the wheat is harvested, the farmer being left free to dispose of his produce in the open market.

The arguments on which the Committee base the above recommendation are as follows :—

The only method of effecting a substantial increase in the *gross* production of food in England and Wales for the harvest of 1916 and later consists in restoring to arable cultivation some of the poorer grass land that has been laid down since the 'seventies. In this way a large increase in the area under wheat may be obtained upon the existing arable land, while the newly broken-up grass may be devoted to the later-sown crops displaced by wheat. An increase in the area under arable cultivation will, with proper farming, add to the production of wheat and other crops for human consumption, without diminishing the capacity of the country to maintain its existing live stock and its output of meat and milk. Such increase in the arable area must necessitate a greater or more effective employment of labour, but the Committee



believe that over the larger part of the country no such serious shortage of agricultural labour exists as would render their proposals impracticable, although they consider that something may be done to assist the farmer in carrying out the work that he is desired to undertake by an organisation of the supplies of labour-saving machinery and of manure.

To obtain any substantial increase in the production of wheat, oats and potatoes in England and Wales, it will be necessary for farmers to sacrifice the comparative certainty of their present profits, to change some of their methods, to alter their rotations, and to increase their area of arable cultivation in the face of a shortage of labour. In addition they will have to run the risk, not only of uncertain seasons, but also of a fall in the price of wheat at the conclusion of the war. The Committee believe that many farmers would be disposed to make efforts to increase the production of wheat, if appealed to in the national interest. But in order to ensure a general movement in that direction they consider the guarantee which they recommend to be essential.

The Committee estimate that the giving of this guarantee would probably result in the area cropped with wheat, which is now just under two million acres, being increased by at least another million acres next year, and that, therefore, from four to five million qr. more wheat would be grown at home—or fully six weeks' additional supply for the whole of the United Kingdom.

The Committee considered the financial aspects of the above recommendation and suggested certain safeguards, but, in view of the fact that the Government have decided not to adopt the recommendation regarding a guaranteed minimum price for wheat, these safeguards need not be reviewed here in detail.

The Committee further recommend that the Government should, without delay, create a local organisation which, in every district, will give farmers a clear lead as to the crops which are considered desirable; the object would be to secure an increase in food production by means of a well-organised effort in every county, careful regard being had to the natural capacity of different parts of the country.

The remainder of the Report deals with restrictive covenants, rent and wages. As it is clearly a national duty to see that all land is kept up to the greatest possible pitch of productivity, where the consent of the landowner to the breaking up of grass land is necessary, the Committee are of opinion that such consent ought not to be withheld; rent should not be increased by reason of the guarantee; and landowners should make sure that their tenants, by good farming, shall put themselves in a position to take advantage of any Government scheme which may be instituted. The Committee are also of opinion that the guarantee would have the effect of bringing about a rise in the rate of agricultural wages, and that if this is not realised by the operation of natural causes it would be desirable to take further measures to ensure it, should the proposed guarantee be given.

#### *Report of the Committee for Scotland.*

The Scottish Committee, of which the Rt. Hon. Eugene Wason, M.P., was Chairman, considered the means whereby the food supplies of the country may be maintained or increased under three heads:—

- A. Increased production.
- B. Avoidance of waste.
- C. Using sources of supply not at present available.

The following is a summary of the Committee's principal recommendations :

*A.—Increase of Production.*—Basic slag should be much more generally used for the improvement of grass land and artificial manures should be more generally used in growing crops, especially grain crops. The export of artificial manures should be allowed only under special licence. Where practicable there should be an extension of land under wheat and oats. The advisability of change of seed and of the use of new varieties of oats and other seeds should in all cases be carefully considered at this time. A representation should be made to the railway companies that, following the precedent they have made by carrying breeding horses at reduced rates, they should charge a modified rate for the carriage of grain and potatoes certified to be used for seed.

Wherever possible a greater number of calves should be reared. The keeping of pigs should be encouraged, and to encourage this there should be, so far as is consistent with a due regard for the public health, a relaxation of the by-laws relating to pig-sties, especially in rural districts. The keeping of poultry and the increase of egg production should be encouraged. The prohibition of the export of all feeding stuffs should be continued.

The Board of Agriculture for Scotland should promote and assist demonstrations of the use of motor power in ploughing and other agricultural operations. It should be represented to the military authorities and recruiting agencies that any attempt to increase or even maintain the food production of the country would be made impossible by a further withdrawal from agricultural labour of experienced workers. So far as educational interests allow, School Boards should consider agricultural needs in fixing the time of the school holidays, and should also have regard to special agricultural emergencies in dealing with applications for exemption from school attendance.

Allotments should be provided in the neighbourhood of towns and villages.

Co-operative organisation for the purchase of farming requirements and the sale of produce should be encouraged.

*B.—Avoidance of Waste.*—All liquid manure should be carefully conserved for application to the land. Straw should be saved for fodder as much as possible, and not used unnecessarily for litter. The Prevention of the Slaughter of Animals Order (1915) should on its expiry be renewed so far as it deals with in-calf cows, and calves suitable for rearing as beef-producing animals.

All landowners and shooting tenants should be urged in the interests of the national food supply either to kill as many rabbits as possible or, to net woodlands and plantations, or as an emergency measure to allow agricultural tenants the unrestricted privilege of killing rabbits, including (a) the right of entry into woods, (b) the employment of such increased numbers of men as may be necessary for the work, and (c) permission to kill rabbits on moors without reference to any time limit.

Assistance, by defraying a proportion of the cost, should be given by the Board of Agriculture for Scotland to duly constituted bodies who submit to the Board satisfactory schemes for dealing with plagues of rats, sparrows, rooks, or pigeons.

An appeal should be made to all owners of deer forest and grouse moors to allow these to be used—so far as practicable—for grazing cattle or sheep on terms to be mutually arranged. All artificial rearing

of game should be discouraged. The fullest possible use for grazing purposes should be made of golf courses and policies.

*General.*—A Committee should be set up in the area of each District Committee of each County Council, called the District Agricultural Committee, with the special duty of stimulating production by all possible means. The District Agricultural Committees should co-operate with any agencies which might be able to secure new sources of labour suitable for farm work.

The Governors of the three Agricultural Colleges should be requested to instruct the members of their staffs to co-operate with the District Agricultural Committees, and that, as far as it is possible the members of the College Staff should be relieved of their present duties in order that they may promote the object for which the District Agricultural Committees have been set up.

In order to make more effective the proceedings of the County Agricultural Committees, it should be made the duty of an official to be appointed by the Board of Agriculture for Scotland to give such help to these Committees as they may require, to attend their meetings so far as practicable, and to obtain for them such information as they may from time to time desire in the discharge of their duties, and to suggest to them matters for their consideration.

Separate recommendations are made by Mr. Harry Hope as to the constitution and duties of the District Committees. Mr. J. F. Duncan, Mr. Hannah and Professor Somerville make the following recommendations:—

(1) That in the case of all land under rye-grass and other rotation grasses and clover, except such as has been sown with grass and clover in the springs of 1914 or 1915, farmers shall be required to plough up and put under a crop, other than grass or clover, twice as much as they similarly dealt with in 1914-15, provided that such larger area is in existence on their respective holdings.

(2) Farmers desiring exemption from this obligation may appeal to a local committee, acting in conjunction with the Board of Agriculture for Scotland, whose decision shall be conclusive.

#### *Report of the Committee for Ireland.*

The Report, which is dated the 14th August, is signed by all the members of the Committee, of which the Rt. Hon. T. W. Russell, M.P., the Vice-President of the Department of Agriculture and Technical Instruction for Ireland, was Chairman, with the exception of Sir Horace Plunkett, who submits a Minority Report.

*Majority Report.*—The Committee state that, assuming that the Government takes the responsibility of deciding whether exceptional steps should be taken in order to increase the growth of certain crops, then the measure calculated to effect this object in Ireland is the guaranteeing by the Government of a minimum price for wheat and oats. The Committee further agree that the minimum price should apply only to the specific crops named.† In regard to the amount of the minimum price, the Committee recommend that the figure should be most carefully estimated "with a view to its being no more than enough to give the farmer a feeling of security in growing the required crop, having regard to the normal conditions of business." As to the length of time during which the guaranteed minimum price should operate, the Committee hold that it should be for one year only. A proposal

going beyond this limit would, it is stated, be regarded as exceeding the requirements of a war measure, and as contemplating a policy upon the expediency of which opinions are sharply at variance.

The Committee are agreed as to the need of a system by which loans should be made to small holders to obtain implements and machinery, and suggest that the County Committees of Agriculture might be asked to take charge of such a scheme in their several districts.

The Committee are unanimous in recommending the prohibition of the export from the United Kingdom of artificial manures and of the constituents used in their manufacture. This prohibition, the Committee considers, is specially necessary in the case of basic slag and sulphate of ammonia.

The Report concludes with an appeal to landholders and labourers to put forth their best energies to promote the vital interests of themselves and their fellow countrymen.

*Sir Horace Plunkett's Minority Report.*—Sir Horace Plunkett, in his separate Report, explains that the intention contained in the terms of reference is: the working farmers have to be moved to produce more food, and the only question is: How? He then examines the three principles of action (1) Compulsion, (2) Inducement, and (3) Persuasion. Sir Horace agrees with the majority in not recommending compulsion, and is in general agreement with them in regard to their proposal that inducements in the form of insurance against loss should be offered if the Government press upon the farmer an extraordinary departure from his usual method of cultivation. "It is when the majority come to the vastly more important question—what measures might lead to a natural, voluntary and continuing increase in the production of food.—" that Sir Horace is completely at variance with them. He gives fuller consideration than is given in the Majority Report to the problem of increasing tillage, the labour question and co-operation. His recommendations on these points are summarised as follows:—

Continuous cropping recommended upon small holdings.

Labour to be organised and mobilised through the agency of Labour Exchanges. No legislative action for raising wages until it is proved that labour does not get its full share of any increase in the revenue of the farmer. Temporary employment of refugees, prisoners of war, etc., to be considered.

Co-operative organisation to be encouraged; and, more especially, to be utilised in enabling small holders to acquire and use suitable implements and machinery.

A small joint committee, consisting of representatives of the Department and the Irish Agricultural Organisation Society, with an impartial chairman, to co-ordinate State assistance with organised voluntary effort in food production, and to move the Government to take certain measures in regard to labour, the supply of agricultural implements and manures, and the provision of funds needed for the combined campaign of better farming and better business.

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## OFFICIAL NOTICES AND CIRCULARS.

THE President of the Board of Agriculture and Fisheries has under consideration the steps which can be taken, in the interests of the home producers and of sellers of genuine

<b>Description of Eggs as Fresh and New Laid.</b>	new laid and fresh eggs, to deal more effectively with the application of the descriptions "new laid," and "fresh" to eggs which, in view of their age or condition, should not be described by these terms, and he has directed an enquiry to be made into the meaning of the terms "new laid" and "fresh" as applied to eggs. The principal question involved is the number of days from the date of laying up to which an egg may properly be described by these terms.
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LORD SELBORNE, President of the Board of Agriculture and Fisheries, after consultation with the Chairman of the Advisory Council on Light Horse Breeding, has appointed a Committee to consider and advise the Board what steps should be taken to secure the production and maintenance in England and Wales of a supply of horses suitable and sufficient for military purposes, especially on mobilisation.

The Committee consists of the following members :—

The Lord Middleton (*Chairman*).

The Right Hon. Henry Chaplin, M.P.

The Right Hon. Sir Ailwyn Fellowes, K.C.V.O.

The Hon. Alexander Parker.

Major Sir Merrik Burrell, Bart.

Sir Gilbert Greenall, Bart., C.V.O., and

Captain M. S. Adye.

Mr. E. B. Wilson, of the Board of Agriculture and Fisheries, has been appointed Secretary of the Committee.

LORD SELBORNE, the President of the Board of Agriculture and Fisheries, received a deputation on the 10th August from the Free

<b>Deputation on the Importation of Canadian Cattle.</b>	Importation of Canadian Cattle Association and other bodies, to urge upon him the desirability of allowing store cattle from Canada to be landed for fattening on farms in this country. The deputation was introduced by Mr. Edward Watson, Chairman of the Association, and the speakers were Mr. Albert Wadman, farmer, of Sussex, Alderman Stevenson, of Liverpool, Mr. Harry Barnett, of the Jewish Masters' Protection Association, and Mr. H. T. May, Secretary of the Parliamentary Committee of the Co-operative Congress.
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In replying, Lord Selborne acknowledged the importance of the deputation, and of the opinions which they expressed, but pointed out that at the beginning of the second year of war we found ourselves with a record head of cattle in the country, which was free from any malignant cattle disease. This was in itself a great justification of the policy of his predecessors of both political parties. The reason why the price of meat had risen was because of the shortage of our over-seas supplies of meat. This was largely a question of tonnage, which applied as much to live cattle as to dead meat. At the present

moment what the people of the country most required was not unfinished store cattle, but meat which they could eat, and he was doing all that he could to revive the trade in cattle to be landed for slaughter. He did not share their opinions, and could not accede to their request, but, as a matter of fact, his answer would have to be the same if he agreed with them, because to meet their views, a Bill amending the existing law would be required, which, under the bargain binding on all parties in the House of Commons at the present time, could not possibly be passed because of its controversial character.

THE Board have issued the following circular letter, dated 21st August, 1915, to the County Councils, Borough Councils (including Metropolitan Borough Councils), and District Councils in England and Wales :—

**Maintenance of  
Live Stock Order  
of 1915.**

Sir,—I am directed by the President of the Board of Agriculture and Fisheries to enclose, for the information of your Council, a copy of the Maintenance of Live Stock Order of 1915 which as from the 23rd inst. supersedes the Slaughter of Animals Order of 1915, together with a copy of a memorandum approved by Lord Selborne setting forth the considerations which have led to the framing of the Order.

*Prohibition of Slaughter.*

The new Order prohibits, with certain exceptions, the slaughter of—

- (1) Animals which are visibly or obviously in calf or in pig ;
- (2) after the 30th September next all calves in which the first permanent molar or grinder tooth is not cut and visible, which for practical purposes means calves six months' old ; and
- (3) until the 30th September next, calves under the age of eight weeks.

*Exceptions from Restrictions.*

The Order allows by way of exception—

- (1) Slaughter of an animal if necessary or desirable on account of accidental injury to the animal or its illness ;
- (2) slaughter of an animal if desirable for an exceptional reason or purpose, and if the slaughter is licensed by the Board ;
- (3) slaughter of a calf of a cow of Channel Island, Ayrshire, Kerry, or Dexter breed ; and
- (4) slaughter of a calf which has been offered for sale by auction at any market or sale yard in England, Wales, or Scotland without reserve or subject to a reserve price of 30s. or less, and for which no bid exceeding 30s. has been made on such occasion : but this provision will have effect only—
  - (a) If the calf so offered for sale is before movement from the market or sale yard marked with a broad arrow by, or under the direction of, the auctioneer in the manner prescribed by the Order ;\* and
  - (b) if such mark is on the calf at the time of slaughter.

These exceptions should afford a sufficient means of enabling farmers to dispose of calves which are worthless for rearing purposes

\* The prescribed mark for the purposes of the Order is a broad arrow branded, in hot pitch or a mixture of hot pitch and tar, on the back of the calf midway between the hips, the shaft and two barbs of the arrow to be a quarter of an inch in width, and the length of the shaft and of the barbs (outside measurement) to be two and a half inches.

*Local Authorities authorised to enforce the Order.*

By Article 4 of the Order authority to execute and enforce it is given to county councils and their executive committees for the purposes of the Diseases of Animals Acts, and to borough councils (including metropolitan borough councils) and district councils; and provision is made for defraying any expenses so incurred.

Lord Selborne thinks that it should be possible for these authorities by means of their existing officers to secure a general observance of the restrictions on slaughter which the Order imposes in the interests of the general community, and he trusts that your council will take such steps as are practicable to secure this result.

I am, &c., SYDNEY OLIVIER.

## MEMORANDUM.

The Maintenance of Live Stock Order of 1915 has been made by the Board of Agriculture and Fisheries and as from the 23rd August, 1915, supersedes the existing Order dealing with this subject, viz., the Slaughter of Animals Order of 1915.

The main criticisms of the existing Order have been—

- (1) That no adequate provision was made for exempting from the restriction of slaughter, calves which were worthless for rearing purposes; and
- (2) that the necessity of feeding for twelve weeks calves intended for veal, involved an expenditure in excess of any benefit derived from the growth of the calf after normal age at which calves are at their prime for veal.

Lord Selborne recognises that calves which are unfit to rear—that is, on which no farmer can make a profit by keeping them for store cattle or for breeding—have become unsaleable in consequence of the existing Order. These calves are of two classes: (1) those which, although bred from a good cow and a good bull, have some defect or are prematurely born; (2) those got by a bull so inferior that the calf is practically worth nothing, and apparently there are many of this kind, especially those coming from cows used in town dairies. He regards it as discreditable to British agriculture that many owners of cows should apparently take no trouble at all as to the class of bull which they use, and he would be sorry if in any way the Board seemed to encourage or condone such a practice. At the same time these calves are in existence, and will come into existence for some months to come, and he is prepared to make a concession to enable farmers to sell them so far as is possible consistently with the provisions of the Order of the Board against the slaughter of calves, but he wishes it to be distinctly understood that he holds himself free to withdraw this concession on or after the 1st July, 1916. Full notice will thus have been given to all farmers or owners of cows and opportunity given to seek better bulls for use with their cows.

Lord Selborne has given much consideration to the method of enabling calves of these classes to be distinguished from other calves. It was suggested to him that in each district an officer should be appointed who should be authorised to inspect the calves and to brand those which in his judgment were not suitable for rearing. But this proposal really was not a practicable one, as it would mean the appointment of a great number of new officials and the expenditure of a large sum of money, which could not be contemplated at such a time as this. And, again, every such officer appointed would have to act on his own individual judgment and there would be no regularity of practice or fixed standard of quality, which must result in more discontent than content with the manner in which the exemptions were granted.

The procedure which he has determined to adopt and which is embodied in the new Order is to allow the slaughter of a calf which has been offered for sale by auction at any market or sale yard in England, Wales, or Scotland, without reserve or subject to a reserve price of 30s. or less, and for which no bid exceeding 30s. has been made on such occasion; but this provision will have effect only—

(a) if the calf so offered for sale is, before movement from the market or sale yard, marked with a broad arrow, by or under the direction of, the auctioneer in the manner prescribed by the Order; and

(b) if such mark is on the calf at the time of slaughter.

Under the present circumstances if a calf fetches more than 30s. presumably it is worth rearing; if it fetches 30s. or less than 30s. it may be treated as not worth rearing; and, therefore, it would be marked by the auctioneer or his assistant, and would be available for slaughter. There will be no compulsion on the purchaser to slaughter the calf, but, on the other hand, he will be free to do so. This price test does not profess to be anything but a very rough and ready method of meeting the case, but it has the advantage of simplicity and economy, and therefore Lord Selborne has adopted it and intends to give it a fair trial. Under this plan, if the owner of a calf which is worthless to rear wishes to sell it for slaughter, he must send it to a market at which there is an auction, or, if he cannot conveniently so send it himself, he must dispose of it to a dealer who can take it there. By this means the grievance that such a calf cannot be sold for slaughter but must be kept and fed, although worthless to rear, will disappear.

Lord Selborne has had the advantage of a consultation with gentlemen representing the profession of auctioneers, and they have assured him that he may feel confident that the auctioneers can work this plan, and will give the Board every assistance in doing so. He is glad to take this opportunity of expressing his appreciation of their obliging attitude.

In respect of calves which are suitable for rearing he desires to express the hope that dairy farmers will endeavour not to send them to market until they are at least a fortnight old, an age at which many of them would be strong enough to travel comparatively long distances.

The effect of the existing Order has been to prevent any abnormal slaughter of calves, but Lord Selborne, after careful consideration, and after consultation with the Agricultural Consultative Committee appointed by his predecessor, has come to the conclusion that it is practicable and desirable in the public interest that the stock in the country should be increased by the total prohibition for a period of the slaughter of all calves suitable for rearing as stock. The new Order, therefore, provides that after the 30th September next, until the Board shall by Order otherwise provide, the prohibition of slaughter shall be extended, subject to the exemption of worthless calves and of calves of cows of Channel Island, Ayrshire, Kerry, and Dexter breeds, to all calves in which the first permanent molar or grinder tooth is not cut or visible, which, for practical purposes, may be taken to mean calves under six months old.

Until the 30th September the restriction on slaughter of young calves will continue in force, but to meet the criticism above referred to the age has been reduced from twelve weeks to eight.

The effect of the Order will be closely watched with a view to its revocation whenever it has resulted in the desired increase of the stock of the country or the feeding facilities render the maintenance of the restrictions undesirable.

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A two years' poultry laying competition will be held at the Harper Adams Agricultural College, Newport, Salop, commencing on 1st October next.

**Laying Competitions  
of the Harper Adams  
College and the  
Utility Poultry  
Club.**

The object of this competition will be to ascertain the profitable duration of a hen's laying, and how far the constitution of a bird is affected by the strain of a heavy first year's laying. It will also be of interest to note during the test whether the size of egg increases during a second year, and whether increase in broodiness lowers egg-production sufficiently to make the birds unprofitable as well as the cost of feeding for two seasons compared with the value of eggs produced.

The competition will comprise an open section of 40 pens of six pure-bred birds each, to be divided into breed sections as follows :— (1) Leghorns, (2) Wyandottes, (3) Rocks, Orpingtons and Rhode Island Reds, (4) Sussex and Faverolles, (5) any other non-setting breed.

A special feature of this competition will be a section, comprising 10 pens, for farmers and small-holders.

Concurrently with the above two-years' competition, a 12 months' competition, comprising 40 pens in an open-breed section, and 10 pens in the farmers' and small-holders' section (on exactly the same conditions as for the two years' test) will be held. This competition will also commence on 1st October next. All enquiries should be addressed to the Principal of the College.

THE Board of Agriculture and Fisheries propose to adopt, on the occurrence of an outbreak of Swine Fever, a system of treating all the pigs on the infected premises, if the owner consents, by injection of serum.

**Swine Fever—  
Treatment by Serum  
Injection.**

Serum is the yellow fluid separated from the blood of pigs which have been rendered highly resistant to Swine Fever.

Its injection is harmless.

It will not cure Swine Fever in pigs already infected with the disease.

It will protect pigs not infected for ten days from any damaging attack of Swine Fever.

If pigs which have been treated with the serum are mixed with pigs suffering from the disease, they will probably catch Swine Fever in a mild form; and, if they do so before the effects of the serum have worn off, they will remain permanently immune from, or protected against, Swine Fever.

If they are not so mixed, and do not catch the fever in its mild form, they will not remain immune after the ten days, and if infected afterwards will be liable to die of Swine Fever.

Serum will not be injected into pigs without the owner's consent, and the owner of any premises on which Swine Fever is found will be asked whether he will have the animals so treated or not.

It will be to his advantage to do so, because even if they are only protected for ten days, it will be possible for the pigs to be finished for slaughter, or for arrangements to be made for shifting them to a part of the owner's premises which is not infected.

If serum is used, it will be possible to allow owners to restock their premises earlier than under the present regulations of the Board where an outbreak of Swine Fever has occurred.

The Veterinary Inspector, then, at his first visit to premises on which an outbreak of Swine Fever has been reported, will, if he finds

the disease present, offer the owner the choice of having his pigs dealt with either under the ordinary regulations for the time being in force, or by serum treatment.

If the owner chooses serum treatment, the Inspector will further give him the choice either of having all ailing pigs slaughtered, with compensation, or of leaving the ailing pigs alive, so as to infect the other pigs, after they have been treated with serum, with the mild type of Swine Fever which they can catch whilst the serum is active, and which, if caught, will leave them permanently safe afterwards from disease.

In order to be sure of producing this result, it will be best to leave all the ailing pigs alive, and it will be necessary for arrangements to be made, which the Veterinary Inspector will recommend, for so mixing all the pigs in the yard or in their pens, or allowing them to feed from common troughs, as to ensure as far as possible that all the healthy pigs shall catch the infection, which, if the serum has been given before they catch it, will do them little or no harm.

At the same time it must be understood that some pigs, apparently healthy at the time when the serum is given them, may really be already infected with Swine Fever, and in these cases the serum may not protect them from a severe and even fatal attack of the fever.

Pigs that have had Swine Fever in a severe form may survive, but generally remain unthrifty, and unlikely to repay the cost of feeding. They are also likely to suffer from other troubles, such as pneumonia, and thus cause further loss. If any pigs become wasters after the first ten days of the treatment the owner will be wise to slaughter them.

In order to obtain the best results from serum treatment, notification of suspected outbreaks of Swine Fever should be made at the earliest possible date by owners of pigs. Any delay not only renders the owner liable to prosecution, but also tends to increase his loss owing to more pigs becoming affected before serum treatment can be applied.

THE following is a preliminary statement compiled from the returns collected on the 4th June, 1915, showing the acreage under hops in each county of England in which hops were grown, with a comparative statement for the years 1914 and 1913.

COUNTIES, &c.				1915.	1914.*	1913.
				<i>Acres.</i>	<i>Acres.</i>	<i>Acres.</i>
KENT...	East...	..	..	5,727	6,174	6,103
	Mid...	..	..	7,238	7,604	7,481
	Weald...	..	..	8,370	8,848	8,360
	Total, Kent	..	..	21,335	22,626	21,944
HANTS...	..	..	..	1,514	1,580	1,556
HEREFORD...	..	..	..	5,405	5,507	5,439
SALOP...	..	..	..	100	103	104
SURREY...	..	..	..	552	583	557
SUSSEX...	..	..	..	2,864	3,030	2,880
WORCESTER...	..	..	..	2,961	3,194	3,157
OTHER COUNTIES*	..	..	..	13	30	30
TOTAL				34,744	36,661	35,676

\* Gloucester and Stafford.

THE Preliminary Statement of the Agricultural Returns for England and Wales, collected in June last, shows a decrease in the total area under crops and grass of 61,000 acres, of which 33,000 acres represents arable land and 28,000 acres permanent grass. Wheat shows an increase of 363,000 acres, or 20 per cent., as compared with last year, the 2,170,000 acres under this cereal being the largest recorded since 1891; while the increase since 1913 amounts to 469,000 acres, or nearly 28 per cent. Oats have also increased by 158,000 acres. These increases of the two most important corn crops have been obtained mainly by substituting them for barley, beans, peas, and roots. Barley shows a decrease of

*Agricultural Returns of England and Wales, 1915; Preliminary Statement for 1915, compiled from the Returns collected on the 4th June; and comparison with 1914.*

## CROPS.

DISTRIBUTION.	1915.		1914.		INCREASE.		DECREASE.	
	Acres.	Acres.	Acres.	Per Cent.	Acres.	Per Cent.	Acres.	Per Cent.
TOTAL AREA (excluding WATER) ..	37,139,160	37,139,150	—	—	—	—	—	—
TOTAL ACREAGE under all CROPS and GRASS (a) ..	27,053,360	27,114,000	—	—	60,640	0·2	—	—
ARABLE LAND ..	10,865,940	10,993,250	—	—	32,610	0·3	—	—
PERMANENT GRASS (a) {	For Hay ..	4,855,030	4,785,450	—	—	130,420	2·7	—
	Not for Hay ..	11,432,690	11,330,300	102,390	0·9	—	—	—
	TOTAL ..	16,087,720	16,115,750	—	—	28,030	0·2	—
Wheat .. {	Autumn Sown ..	2,029,250	—	—	—	—	—	—
	Spring Sown ..	140,880	—	—	—	—	—	—
Wheat .. TOTAL ..	2,170,110	1,807,500	362,610	20·2	—	—	—	—
Barley ..	1,231,720	1,504,770	—	—	273,050	18·1	—	—
Oats ..	2,068,050	1,909,850	158,420	8·2	—	—	—	—
Rye ..	47,480	53,900	—	—	6,220	11·5	—	—
Beans ..	268,530	294,020	—	—	27,490	9·3	—	—
Peas ..	129,380	168,840	—	—	39,460	27·4	—	—
Buckwheat ..	2,660	3,040	—	—	390	12·8	—	—
Potatoes ..	483,400	461,620	1,780	0·4	—	—	—	—
Turnips and Swedes ..	831,700	1,045,090	—	—	113,390	10·8	—	—
Manifold ..	413,710	432,370	—	—	18,660	4·3	—	—
Cabbage and Kohl-Rabi ..	68,210	67,940	270	0·4	—	—	—	—
Rape ..	65,530	70,460	—	—	4,930	7·0	—	—
Vetches or Tares ..	109,630	123,730	—	—	14,100	11·4	—	—
Lucerne ..	53,000	53,650	—	—	650	1·2	—	—
Hops ..	34,740	36,660	—	—	1,920	5·5	—	—
Small Fruit ..	74,180	77,560	—	—	3,170	4·1	—	—
CLOVER and ROTATION GRASSES {	For Hay ..	1,538,070	1,554,910	—	—	16,840	1·1	—
	Not for Hay ..	824,300	826,440	—	—	2,140	0·3	—
	TOTAL ..	2,362,370	2,381,350	—	—	18,980	0·8	—
OTHER CROPS ..	143,340	145,580	—	—	2,240	1·5	—	—
BARE FALLOW ..	309,940	340,740	—	—	31,100	9·1	—	—
ORCHARDS (b) ..	248,830	243,110	5,720	2·4	—	—	—	—

(a) Excluding Mountain and Heath Land used for grazing (3,764,710 acres in 1915, as compared with 3,781,560 acres in 1914).

(b) Any Crop or Grass grown in Orchards is also returned under its proper heading.

273,000 acres, bringing the total under this crop to the lowest on record. Turnips and swedes have fallen off by 113,000 to 932,000 acres, this being the first occasion on which the total has fallen below a million acres. Hay (whether "seeds" or meadow) has decreased by 147,000 acres. The decrease in hay may largely be attributed to the dry spring, as the area of permanent grass reserved for grazing has increased by 102,000 acres, while clovers and seeds for grazing are about the same as in 1914. The other most important crop for human consumption—potatoes—shows an increase of about 1,800 acres. All other crops, except cabbage and kohlrabi, show decreases of greater or smaller extent.

The live stock returns show increases among cattle and sheep, but decreases among horses and swine. Horses, many of which have been taken for the army, have fallen in number by 112,000 (or 8 per cent.), the greatest relative decrease being among horses not used for agricultural purposes. Cows show a decrease of 50,000 from the record figure of 1914, but are still higher than in any other year; all other cattle have increased, and the total number 6,064,000 (186,000 more than in 1914), constitutes the highest recorded. The increase in sheep amounts to 263,000; those above one year (other than breeding ewes) increasing by a third of a million; but an indifferent lambing season is responsible for a reduction of 101,000 in the number of lambs. The decline of 61,000 in pigs is mostly among breeding sows, but the total is well above the ten-year average.

## LIVE STOCK.

KIND.	1915	1914.	INCREASE.		DECREASE.	
	No.	No.	No.	Per Cent.	No.	Per Cent.
Horses used for Agricultural purposes (including Mares for Breeding)	729,080	791,300	—	—	62,220	7'9
Unbroken Horses (One year and above .. .. .)	209,770	220,570	—	—	10,800	4'9
(Including Stallions) .. .. .	89,240	102,710	—	—	13,470	15'1
Other Horses .. .. .	249,090	285,570	—	—	36,480	14'8
TOTAL OF HORSES .. ..	1,287,180	1,399,550	—	—	112,370	8'6
Cows and Heifers in Milk or in Calf	2,434,600	2,484,220	—	—	49,720	2'0
Other Cattle:—Two years and above	994,330	952,530	42,000	4'4	—	—
One year and under two	1,297,220	1,174,650	122,270	10'4	—	—
Under one year .. ..	1,338,100	1,266,410	71,690	5'7	—	—
TOTAL OF CATTLE .. ..	6,064,150	5,877,940	186,210	3'2	—	—
Ewes kept for Breeding .. ..	6,871,740	6,836,330	35,410	0'5	—	—
Other Sheep:—One year and above	3,481,650	3,151,550	330,100	10'5	—	—
Under one year .. ..	7,169,190	7,269,810	—	—	100,620	1'4
TOTAL OF SHEEP .. ..	17,522,580	17,257,690	264,890	1'5	—	—
Sows kept for Breeding .. ..	298,160	317,380	—	—	19,220	6'4
Other Pigs .. .. .	2,121,870	2,141,100	—	—	19,230	0'9
TOTAL OF PIGS .. ..	2,420,030	2,458,480	—	—	38,450	1'6

### MISCELLANEOUS NOTES.

THE *Bulletin of Agricultural and Commercial Statistics* for August, 1915, issued by the International Institute of Agriculture, gives estimates

**Notes on Crop** of the production of cereal crops this year.  
**Prospects Abroad.** The countries for which it is possible to give an approximate estimate of the production

are as follows:—In *Europe*—Spain; Great Britain; Ireland; Italy; Russia in Europe (54 governments), Switzerland; in *America*—Canada; United States; in *Asia*—India; Japan; in *Africa*—Tunis. *Wheat*—The total production in the above-mentioned countries is estimated to amount to 322,813,000 qr. in 1914-15, as compared with 273,896,000 qr. in the same countries in 1913-14, the increase being equal to 17.9 per cent. The area under cultivation was also greater by 8.4 per cent.

*Rye*.—The estimated production in the specified countries, excluding Great Britain, Canada, India, Japan and Tunis, is placed at 119,984,000 qr. this year, against 101,119,000 qr. last year, or an increase of 18.7 per cent., while the area planted was less by 1.5 per cent.

*Barley*.—The production in the above countries, excluding Canada and India, is estimated at 116,001,000 qr., or an increase of 19 per cent. compared with last year, when the production was 97,440,000 qr. The area sown showed a decrease of 2.5 per cent.

*Oats*.—For the above-mentioned countries, excluding Canada, India and Japan, the estimated production is 270,995,000 qr., against 218,296,000 qr. in 1913-14, the increase amounting to 24.1 per cent., while the area planted was practically the same as last year.

**France**.—The condition of the crops on the 1st August was officially estimated as follows:—Winter wheat, 64 as compared with 68 on the 1st July; spring wheat, 63 against 69; rye, 66 against 71; winter barley, 68 against 73; spring barley, 63 against 69; winter oats, 68 against 71; and spring oats, 65 against 68. (So = good, and 60 = fairly good). (*The London Grain, Seed and Oil Reporter*, 25th August.)

**Holland**.—The total production of the crops is estimated as follows:—Wheat, 777,000 qr. as compared with 672,000 qr. last year; barley, 388,000 qr. against 385,000 qr.; oats, 1,881,000 qr. against 2,046,000 qr.; rye, 1,601,000 qr. against 1,707,000 qr.; potatoes, 2,224,000 tons against 2,512,000 tons; and sugar-beet, 1,776,000 tons against 1,962,000 tons. (*Bulletin of Agricultural and Commercial Statistics*, August, 1915).

**Russia**.—An official report on the crop conditions, up to 28th July, stated that, out of 604 districts of European Russia, winter crops were bad in only 7 districts (1.2 per cent.); medium in 7 districts (1.2 per cent.); satisfactory in 116 districts (19.2 per cent.); good in 344 districts (56.9 per cent.); and excellent in 33 districts (5.5 per cent.). The condition of spring crops improved owing to abundant moisture: 191 districts (31.6 per cent.) reported good crops, 256 districts (42.4 per cent.) satisfactory crops, and 39 districts (6.5 per cent.) medium crops, while only 21 districts (3.5 per cent.) reported bad crops. (*Broomhall's Corn Trade News*, 25th August.)

**United States**.—The Crop Reporting Board of the Bureau of Statistics of the Department of Agriculture, in reporting as to crop conditions on

the 1st September, states that the total production of winter wheat is estimated at 659,000,000 bush. as compared with a yield of 684,990,000 bush. last year; spring wheat at 322,000,000 bush. against 206,027,000 bush.; maize, 2,985,000,000 bush. against 2,672,804,000 bush.; oats, 1,408,000,000 bush. against 1,141,060,000 bush.; barley, 223,000,000 bush. against 194,953,000 bush.; and linseed, 18,000,000 bush. against 15,559,000 bush.—(*The London Grain, Seed and Oil Reporter*, 8th September).

**Australia.**—The wheat crop of Western Australia is officially estimated at 18,000,000 bush.—(*Broomhall's Corn Trade News*, 2nd September)

[In 1914-15 the total production was 2,621,325 bush., and in 1913-14 13,331,350 bush.].

THE Crop Reporters of the Board, in reporting on agricultural conditions in England and Wales on the 1st September, state that the fine weather during the latter half of August greatly assisted the harvesting of the corn crops.

**Agricultural Conditions in England and Wales on 1st September.** Wheat shows a slight improvement, and the yield should practically reach an average. In most districts considerable progress had been made with the cutting, and much had been carried. In the south of the country harvesting operations were hindered by the wet weather in the first two weeks of the month. In many districts also the corn was badly laid by the heavy rains. Barley has not improved during the month, the yield being anticipated to be slightly worse than was estimated on the 1st August, and about 8 per cent. less than the average. Cutting has been general, but not much had yet been carried. Oats have slightly improved, but are still estimated at about 7 per cent. below an average yield. In the south much has been cut and carried, and elsewhere cutting has been general. Both barley and oat straw is short. Beans have deteriorated during the month, and have suffered from blight, and peas also show worse prospects than a month ago.

Potatoes are not so promising as at the date of the last report, and the expected yield is slightly lower. Early varieties are light, while from many districts disease is reported.

Turnips and swedes are very variable, average yields being expected in some districts, while in others the plant is patchy, and growth backward. The crop as a whole is anticipated to be some 8 per cent. below the normal. Mangolds have somewhat improved during the month in some districts; and the prospects are promising, and the yield should not be much below the average.

Apples tend to be small, and are not expected to yield an average crop, pears are slightly over average, while the crop of plums is heavy.

The favourable weather of the latter half of the month has effected some improvement in the prospects of the hop crop, especially in the better managed gardens, and where washing has been continuous, the plant is in a much healthier state. The attacks of aphid have been very persistent, and the crop is expected to be more than 30 per cent. below the average yield.

Pastures have everywhere benefited by the rain, and are full of grass. All classes of stock are doing very well.

Summarising the returns, and expressing an average crop by 100,

the condition of the crops on 1st September indicated probable yields which may be denoted by the following percentages :—Wheat, 100 ; barley, 92 ; oats, 93 ; beans, 94 ; peas, 94 ; potatoes, 99 ; turnips and swedes, 92 ; mangolds, 98 ; hops, 67.

ACCORDING to statements in the Board's *Monthly Agricultural Report* for 1st September, the fine weather of the latter part of August assisted harvesting operations, and mitigated the general shortage of labour. Both skilled and casual labour were reported to be deficient, but not to so great an extent as seriously to interfere with the corn harvest. Reference was made in some districts to the employment of women and soldiers on the farms.

The following local summaries give further details regarding agricultural labour in the different districts of England and Wales :—

*Northumberland, Durham, Cumberland, and Westmorland.*—There was a general shortage in the supply of labour, especially among skilled men, but the essential work was getting done with little delay except in one or two districts. The fine weather during the latter part of August helped considerably as regards harvest work.

*Lancashire and Cheshire.*—Labour was scarce in most districts. The increased employment of machinery has mitigated to some extent the inconvenience due to the shortage of labour.

*Yorkshire.*—Labour was still difficult to obtain, and skilled men especially were lacking. The wages were still high.

*Shropshire and Stafford.*—Labour for the most part was still very scarce.

*Derby, Nottingham, Leicester, and Rutland.*—Labour, both skilled and casual, was generally deficient. Women and schoolboys have been helping with the harvest in some districts.

*Lincoln and Norfolk.*—The shortage in the supply of labour, which was general, was not being felt to any serious extent on the whole. High wages are being paid for the harvest, and with favourable weather the crops will be safely gathered.

*Suffolk, Cambridge, and Huntingdon.*—Labour was deficient, but [not very seriously so in most places, and some help was being obtained from soldiers. Increased wages for harvesters were being paid in several districts.

*Bedford, Northampton, and Warwick.*—The supply of labour was, generally speaking, deficient.

*Buckingham, Oxford, and Berkshire.*—On the whole the labour supply was short, but, thanks partly to the fine weather, farmers have got on fairly well.

*Worcester, Hereford, and Gloucester.*—Labour was deficient generally, but harvest work was getting done. Female labour was utilised in some cases.

*Cornwall, Devon, and Somerset.*—Labour was deficient in most places, especially for casual work. Farmers were, however, managing fairly well, the dry weather having facilitated harvesting.

*Dorset, Wiltshire, and Hampshire.*—Labour was very deficient, casual labour being difficult to get, but the deficiency was being made up to a certain extent by the employment of women and soldiers. Wages have increased. The fine weather towards the end of the month enabled the harvesting operations to be carried on with a minimum of labour.

*Surrey, Kent, and Sussex.*—There was a deficiency of labour in most districts, but it was not stated that work was backward anywhere on that account.

*Essex, Hertford, and Middlesex.* Labour was scarce, but farmers were getting through the work fairly well. In south west Essex market gardeners were suffering as they could not get enough men to keep the crops clean.

*North Wales.*—A shortage of labour was reported from most districts, but on the whole the deficiency did not appear to be serious, and harvesting was well in hand.

*Mid Wales.*—On the whole there was a scarcity of labour, but serious shortage was reported only from North Montgomery.

*South Wales.*—There was a general complaint of shortage, more particularly in casual labour.

**Prevalence of  
Animal Diseases  
on the Continent.**

The following statement shows that according to the information in the possession of the Board on 1st September, 1915, certain diseases of animals existed in the countries specified:—

*Austria (on the 4th Aug.).*

Foot-and-Mouth Disease, Glanders and Farcy, Swine Erysipelas, Swine Fever.

*Denmark (month of June).*

Anthrax, Foot-and-Mouth Disease (1,201 outbreaks), Glanders and Farcy, Swine Erysipelas, Swine Fever.

*France (for the period 8th—21st Aug.).*

Foot-and-Mouth Disease, Glanders and Farcy, Sheep-pox.

*Germany (for the period 15th—31st July).*

Foot-and-Mouth Disease, Glanders and Farcy, Swine Fever.

*Holland (month of July).*

Anthrax, Foot-and-Mouth Disease (129 outbreaks), Foot-rot, Swine Erysipelas.

*Hungary (on the 4th Aug.).*

Foot-and-Mouth Disease, Glanders and Farcy, Swine Erysipelas, Swine Fever.

*Italy (for the period 9th—15th Aug.).*

Anthrax, Blackleg, Foot-and-Mouth Disease (500 outbreaks), Glanders and Farcy, Rabies, Sheep-scab, Swine Fever, Tuberculosis.

*Norway (month of July).*

Anthrax, Blackleg.

*Rumania (for the period 9th July—5th Aug.).*

Anthrax, Foot-and-Mouth Disease, Glanders and Farcy, Rabies, Sheep-pox, Swine Erysipelas, Swine Fever.

*Russia (month of March).*

Anthrax, Foot-and-Mouth Disease (50,278 animals), Glanders and Farcy, Pleuro-pneumonia, Rabies, Sheep-pox, Swine Erysipelas, Swine Fever.



*Spain (month of June).*

Anthrax, Blackleg, Dourine, Glanders, Pleuro-pneumonia, Rabies, Sheep-pox, Sheep-scab, Swine Erysipelas, Tuberculosis.

*Sweden (month of July).*

Anthrax, Blackleg, Swine Erysipelas, Swine Fever.

*Switzerland (for the period 9th—15th Aug.).*

Anthrax, Blackleg, Foot-and-Mouth Disease (37 "étales" entailing 3,375 animals, of which 8 "étales" were declared infected during the period), Swine Fever.

No further returns have been received in respect of the following countries:—Belgium, Bulgaria, Montenegro, Serbia.

## The Weather in England during August.

District.	Temperature.		Rainfall.			Bright Sunshine.		
	Daily Mean.	Diff. from Average.	Amount.	Diff. from Average.	No. of Days with Rain.	Daily Mean.	Diff. from Average.	
<i>Week ending Aug. 7th :</i>								
England, N.E. ....	58·8	+0·1	0·76	19	+ 1	6	3·3	-2·3
England, E. ....	61·8	+1·3	1·05	27	+13	6	5·0	-1·2
Midland Counties ...	59·9	+0·1	1·24	32	+18	6	3·1	-2·5
England, S.E. ....	61·7	+0·2	0·66	17	+ 5	5	3·8	-2·6
England, N.W. ....	58·3	-0·7	1·35	34	+14	5	2·0	-3·4
England, S.W. ....	59·7	-0·2	1·12	28	+11	5	2·9	-3·2
English Channel ...	60·8	-0·9	0·59	15	+ 2	5	4·8	-3·3
<i>Week ending Aug. 14th :</i>								
England, N.E. ....	60·9	+2·5	1·00	25	+10	5	4·9	-0·5
England, E. ....	62·6	+2·4	0·69	18	+ 6	5	4·7	-1·5
Midland Counties ...	61·7	+2·3	0·69	18	+ 4	5	5·1	-0·5
England, S.E. ....	63·0	+1·7	0·47	12	0	4	5·1	-1·4
England, N.W. ....	60·5	+1·9	0·82	21	+ 1	5	4·8	-0·5
England, S.W. ....	62·0	+2·4	0·77	20	+ 3	6	5·0	-0·6
English Channel ...	62·7	+0·9	0·55	14	0	4	7·1	-1·1
<i>Week ending Aug. 21st :</i>								
England, N.E. ....	57·8	-0·2	0·27	7	- 8	3	3·9	-1·3
England, E. ....	58·4	-1·4	0·49	12	- 2	2	5·4	-0·7
Midland Counties ...	58·3	-0·8	0·27	7	- 8	2	4·4	-1·2
England, S.E. ....	59·1	-2·0	0·31	8	- 6	3	6·4	-0·2
England, N.W. ....	57·9	-0·4	0·67	17	- 3	2	5·5	+0·4
England, S.W. ....	58·6	-0·7	0·11	3	-16	1	8·3	+2·1
English Channel ...	60·3	-1·4	0·00	0	-15	0	10·5	+2·6
<i>Week ending Aug. 28th :</i>								
England, N.E. ....	59·9	+2·4	0·29	7	- 9	1	7·3	+2·3
England, E. ....	60·3	+0·9	0·03	1	-13	1	7·3	+1·5
Midland Counties ...	59·1	-0·7	0·15	4	-13	1	6·6	+1·4
England, S.E. ....	61·2	+0·6	0·00	0	-16	0	7·3	+1·1
England, N.W. ....	58·9	+1·3	0·29	7	-16	1	5·4	+0·6
England, S.W. ....	60·0	+1·1	0·03	1	-21	1	7·6	+1·7
English Channel ...	62·3	+0·9	0·00	0	-15	0	9·9	+2·7

\*  $\frac{1}{8}$  inch = 3·4 millimetres.

## DISEASES OF ANIMALS ACTS, 1894 to 1914.

NUMBER OF OUTBREAKS, and of ANIMALS Attacked  
or Slaughtered,

## GREAT BRITAIN.

(From the Returns of the Board of Agriculture and Fisheries.)

DISEASE.	AUGUST.		EIGHT MONTHS ENDED AUGUST.	
	1915.	1914.	1915.	1914.
<b>Anthrax:—</b>				
Outbreaks ... ..	25	36	418	518
Animals attacked ... ..	27	42	478	564
<b>Foot-and-Mouth Disease:—</b>				
Outbreaks ... ..	—	3	—	14
Animals attacked ... ..	—	17	—	91
<b>Glanders (including Farcy):—</b>				
Outbreaks ... ..	4	5	36	73
Animals attacked ... ..	6	7	65	219
<b>Parasitic Mange:—</b>				
Outbreaks ... ..	45	18	*580	1,521
Animals attacked ... ..	89	20	*1,260	2,633
<b>Sheep-Scab:—</b>				
Outbreaks ... ..	2	3	161	153
<b>Swine Fever:—</b>				
Outbreaks ... ..	246	222	2,993	2,821
Swine Slaughtered as diseased or exposed to infection ...	982	1,421	13,342	28,939

\* Figures for five months only, the Parasitic Mange Order of 1911 having been suspended from 6th August, 1914, to 27th March, 1915, inclusive.

## IRELAND.

(From the Returns of the Department of Agriculture and  
Technical Instruction for Ireland.)

DISEASE.	AUGUST.		EIGHT MONTHS ENDED AUGUST.	
	1915.	1914.	1915.	1914.
<b>Anthrax:—</b>				
Outbreaks ... ..	—	—	1	1
Animals attacked ... ..	—	—	1	1
<b>Foot-and-Mouth Disease:—</b>				
Outbreaks ... ..	—	—	—	76
Animals attacked ... ..	—	—	—	957
<b>Glanders (including Farcy):—</b>				
Outbreaks ... ..	—	—	1	—
Animals attacked ... ..	—	—	3	—
<b>Parasitic Mange:—</b>				
Outbreaks ... ..	9	7	53	62
<b>Sheep-Scab:—</b>				
Outbreaks ... ..	22	15	290	390
<b>Swine Fever:—</b>				
Outbreaks ... ..	13	16	175	158
Swine Slaughtered as diseased or exposed to infection ...	90	107	1,000	819

## PRICES OF AGRICULTURAL PRODUCE.

AVERAGE PRICES of LIVE STOCK in ENGLAND and WALES  
in August and July, 1915.

(Compiled from Reports received from the Board's Market  
Reporters.)

Description.	AUGUST.		JULY.	
	First Quality.	Second Quality.	First Quality.	Second Quality.
<b>FAT STOCK:—</b>	per stone.*	per stone.*	per stone.*	per stone.*
<b>Cattle:—</b>	<i>s. d.</i>	<i>s. d.</i>	<i>s. d.</i>	<i>s. d.</i>
Fatted Scots ... ..	13 4	12 3	13 4	12 4
Herefords ... ..	13 2	12 0	13 4	12 0
Shorthorns ... ..	13 3	12 2	13 2	12 1
Devons ... ..	13 4	12 5	13 4	12 0
Welsh Runts ... ..	13 3	12 7	13 3	12 7
	per lb.*	per lb.*	per lb.*	per lb.*
	<i>d.</i>	<i>d.</i>	<i>d.</i>	<i>d.</i>
Veal Calves ... ..	10½	9½	10½	9½
<b>Sheep:—</b>				
Downs ... ..	11	10½	11	10
Longwools ... ..	10½	9½	10½	9½
Cheviots ... ..	11	10	11½	10
Blackfaced ... ..	10½	9½	10½	9½
Welsh ... ..	10½	9½	10½	9½
Cross-breds ... ..	11	10	10½	10
	per stone.*	per stone.*	per stone.*	per stone.*
	<i>s. d.</i>	<i>s. d.</i>	<i>s. d.</i>	<i>s. d.</i>
<b>Pigs:—</b>				
Bacon Pigs ... ..	9 9	9 3	9 7	9 0
Porkers ... ..	10 2	9 9	9 11	9 5
<b>LEAN STOCK:—</b>	per head.	per head.	per head.	per head.
	<i>£ s.</i>	<i>£ s.</i>	<i>£ s.</i>	<i>£ s.</i>
<b>Milking Cows:—</b>				
Shorthorns—In Milk ...	26 17	22 2	26 6	21 10
„ —Calvers ... ..	25 7	21 5	24 12	20 13
Other Breeds—In Milk ...	24 4	19 17	24 3	19 9
„ —Calvers ... ..	19 5	17 17	18 0	16 10
Calves for Rearing ... ..	3 3	2 8	3 5	2 10
<b>Store Cattle:—</b>				
Shorthorns—Yearlings ...	13 17	11 15	13 9	11 5
„ —Two-year-olds... ..	19 6	16 19	18 9	16 2
„ —Three-year-olds... ..	25 18	22 5	23 19	20 18
Herefords —Two-year-olds... ..	21 19	18 15	21 0	17 5
Devons— „ ... ..	19 16	17 12	18 10	16 8
Welsh Runts— „ ... ..	19 10	17 15	17 10	16 18
<b>Store Sheep:—</b>				
Hoggs, Hoggets, Togs, and Lambs—	<i>s. d.</i>	<i>s. d.</i>	<i>s. d.</i>	<i>s. d.</i>
Downs or Longwools ...	45 5	39 2	44 1	36 8
<b>Store Pigs:—</b>				
8 to 12 weeks old ... ..	28 1	22 2	26 11	21 1
12 to 16 weeks old ... ..	44 0	33 11	41 5	32 1

\* Estimated carcass weight.

AVERAGE PRICES of DEAD MEAT at certain MARKETS in  
ENGLAND in August, 1915.

*(Compiled from Reports received from the Board's Market  
Reporters.)*

Description.	Quality.	Birming- ham.	Leeds.	Liver- pool.	Lon- don.	Man- chester.
		per cwt.	per cwt.	per cwt.	per cwt.	per cwt.
<b>BEEF:—</b>		<i>s. d.</i>	<i>s. d.</i>	<i>s. d.</i>	<i>s. d.</i>	<i>s. d.</i>
English ... ..	1st	87 6	86 6	86 6	90 6	85 0
	2nd	84 6	84 0	84 0	85 0	81 6
Cow and Bull ... ..	1st	79 6	79 6	77 6	77 0	76 6
	2nd	74 6	72 6	71 0	72 6	71 6
Irish: Port Killed ... ..	1st	—	83 0	85 0	87 6	83 0
	2nd	—	79 6	80 0	82 0	78 0
Argentine Frozen—						
Hind Quarters ... ..	1st	77 0	78 6	76 0	77 0	76 0
Fore " ... ..	1st	71 6	71 6	66 6	66 6	66 6
Argentine Chilled—						
Hind Quarters ... ..	1st	86 6	82 6	83 0	86 6	83 0
Fore " ... ..	1st	71 6	69 0	70 0	69 0	70 0
Australian Frozen—						
Hind Quarters ... ..	1st	75 0	74 0	76 6	75 0	76 6
Fore " ... ..	1st	70 0	69 0	67 0	67 6	67 0
<b>VEAL:—</b>						
British ... ..	1st	86 6	80 6	84 6	96 0	83 0
	2nd	80 6	74 6	74 6	87 6	76 0
Foreign ... ..	1st	—	—	—	91 0	—
<b>MUTTON:—</b>						
Scotch ... ..	1st	—	—	—	93 6	89 0
	2nd	—	—	—	88 6	86 6
English ... ..	1st	87 6	90 0	—	90 0	85 6
	2nd	76 0	85 6	—	83 6	80 6
Irish: Port Killed ... ..	1st	—	—	84 0	86 6	83 0
	2nd	—	—	79 6	81 6	70 0
Argentine Frozen ... ..	1st	63 6	63 6	63 0	66 0	63 0
Australian " ... ..	1st	60 0	60 0	50 6	62 6	59 0
New Zealand " ... ..	1st	68 6	—	—	68 0	—
<b>LAMB:—</b>						
British ... ..	1st	87 6	89 0	88 6	95 6	92 6
	2nd	84 0	84 0	80 6	88 0	88 0
New Zealand ... ..	1st	81 0	81 0	79 6	78 6	79 6
Australian ... ..	1st	76 6	73 6	73 6	75 0	73 6
Argentine ... ..	1st	75 0	72 6	74 6	74 0	74 6
<b>PORK:—</b>						
British ... ..	1st	84 6	78 0	78 0	85 0	76 0
	2nd	81 6	74 0	71 0	80 0	69 6
Foreign ... ..	1st	—	—	—	—	—

**AVERAGE PRICES of PROVISIONS, POTATOES, and HAY at  
certain MARKETS in ENGLAND in August, 1915.**

*(Compiled from Reports received from the Board's Market  
Reporters.)*

Description.	BRISTOL.		LIVERPOOL.		LONDON.	
	First Quality.	Second Quality.	First Quality.	Second Quality.	First Quality.	Second Quality.
<b>BUTTER:—</b>	<i>s. d.</i>	<i>s. d.</i>	<i>s. d.</i>	<i>s. d.</i>	<i>s. d.</i>	<i>s. d.</i>
British ... ..	per 12 lb. 17 0	per 12 lb. 15 6	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.
Irish Creamery—Fresh	per cwt. 157 6	per cwt. 152 0	per cwt. 157 0	per cwt. 154 0	per cwt. 158 0	per cwt. 153 0
„ Factory ... ..	140 6	135 0	138 0	134 0	144 0	137 0
Danish... ..	—	—	172 6	169 6	172 0	168 0
French... ..	—	—	—	—	146 6	140 6
Russian ... ..	139 6	132 6	138 6	134 6	135 0	130 6
Australian ... ..	—	—	—	—	142 0	138 0
New Zealand ... ..	—	—	—	—	—	—
Argentine ... ..	—	—	—	—	148 0	144 0
<b>CHEESE:—</b>						
British—						
Cheddar ... ..	88 0	76 0	96 6	92 6	93 0	85 0
Cheshire ... ..	—	—	120 lb. 81 6	120 lb. 77 0	120 lb. 89 0	120 lb. 81 0
Canadian ... ..	78 0	75 0	per cwt. 76 6	per cwt. 73 6	per cwt. 75 6	per cwt. 72 0
<b>BACON:—</b>						
Irish (Green) ... ..	104 6	101 0	102 0	98 0	102 0	98 0
Canadian (Green sides)	89 0	85 0	88 6	78 6	90 0	86 0
<b>HAMS:—</b>						
York (Dried or Smoked) ... ..	120 0	116 0	—	—	120 0	116 0
Irish (Dried or Smoked)	—	—	—	—	121 0	111 0
American (Green) (long cut) ... ..	72 6	70 0	72 6	69 0	70 6	67 0
<b>EGGS:—</b>	<i>per 120.</i>	<i>per 120.</i>	<i>per 120.</i>	<i>per 120.</i>	<i>per 120.</i>	<i>per 120.</i>
British... ..	14 9	13 11	—	—	15 10	15 0
Irish ... ..	14 1	13 10	14 3	13 3	14 10	14 4
Danish... ..	—	—	—	—	16 1	14 6
<b>POTATOES:—</b>	<i>per ton.</i>	<i>per ton.</i>	<i>per ton.</i>	<i>per ton.</i>	<i>per ton.</i>	<i>per ton.</i>
Early Eclipse... ..	105 0	90 0	—	—	88 6	80 0
Other First Earlies ...	92 6	77 6	81 6	76 6	81 0	73 6
British Queen ... ..	98 6	82 6	101 6	93 6	87 6	80 0
<b>HAY:—</b>						
Clover ... ..	—	—	142 6	112 6	117 0	107 6
Meadow ... ..	—	—	—	—	108 0	98 0

AVERAGE PRICES of **British Corn** per Quarter of 8 Imperial Bushels, computed from the Returns received under the Corn Returns Act, 1882, in each Week in 1913, 1914 and 1915.

Weeks ended (in 1915).	WHEAT.						BARLEY.						OATS.					
	1913.	1914.	1915.	1913.	1914.	1915.	1913.	1914.	1915.	1913.	1914.	1915.	1913.	1914.	1915.			
Jan. 2...	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.			
" 9...	30 5 31 1	44 4 28 6	26 2 29 10	19 10 18 2	26 6	" 16...	30 3 30 11	46 2 28 4	25 11 29 7	19 2 18 4	26 5	" 23...	30 5 31 0	48 9 28 6	26 0 30 5			
" 23...	30 11 30 11	51 6 28 10	26 3 31 3	19 4 18 6	27 6	" 30...	31 1 31 1	52 8 28 11	26 6 32 5	20 2 19 1	29 10	" 6...	31 0 31 0	53 3 28 10	26 7 33 7			
Feb. 6...	31 0 31 0	54 8 29 1	26 7 34 7	20 2 18 11	31 1	" 13...	30 9 31 0	54 8 29 1	26 7 34 7	20 2 18 11	31 1	" 20...	30 11 31 0	56 0 28 8	26 7 34 11			
" 20...	30 11 31 0	56 0 28 6	26 6 35 3	20 4 18 11	31 8	" 27...	31 0 31 0	56 0 28 6	26 6 35 3	20 4 18 11	31 8	" 6...	31 3 31 5	55 11 28 5	26 2 34 6			
Mar. 6...	31 3 31 6	54 8 27 11	26 0 33 5	20 2 18 7	31 0	" 13...	31 1 31 6	54 8 27 11	26 0 33 5	20 2 18 7	31 0	" 20...	31 1 31 5	53 9 28 6	25 8 32 2			
" 20...	31 1 31 5	53 9 28 6	25 7 31 11	19 7 18 8	30 6	" 27...	31 3 31 4	54 3 27 6	25 7 31 11	19 7 18 8	30 6	" 6...	31 4 31 6	54 6 27 0	25 6 31 9			
Apr. 3...	31 4 31 6	54 6 27 0	25 6 31 9	19 2 18 5	30 6	" 10...	31 3 31 5	54 9 27 8	26 8 31 3	19 2 18 5	30 6	" 17...	31 6 31 7	55 4 26 11	25 4 30 10			
" 17...	31 6 31 7	55 4 26 11	25 4 30 10	18 10 18 4	30 5	" 24...	31 8 31 9	56 5 26 7	26 6 31 5	19 3 18 5	30 11	" 1...	32 2 31 9	58 3 25 11	26 0 32 7			
May 1...	32 2 31 9	58 3 25 11	26 0 32 7	19 6 18 5	31 5	" 8...	32 6 32 2	00 5 25 9	25 6 33 3	19 6 18 9	32 4	" 15...	32 10 32 7	61 7 25 4	26 3 34 0			
" 15...	32 10 32 7	61 7 25 4	26 3 34 0	19 9 18 11	32 5	" 22...	32 10 33 0	62 0 25 3	25 10 34 1	19 11 19 0	32 8	" 29...	32 7 33 9	61 11 26 1	26 1 34 8			
" 29...	32 7 33 9	61 11 26 1	26 1 34 8	20 1 19 4	32 7	" 5...	32 10 34 0	61 9 26 2	25 11 35 4	19 8 19 4	32 5	" 12...	32 8 34 1	60 1 24 7	24 11 34 5			
June 5...	32 8 34 1	60 1 24 7	24 11 34 5	20 2 19 8	32 4	" 19...	32 8 34 3	52 0 24 3	25 4 34 4	19 1 20 0	31 9	" 26...	32 8 34 1	56 1 23 10	25 10 34 3			
" 19...	32 8 34 3	52 0 24 3	25 4 34 4	19 1 20 0	31 9	" 26...	32 8 34 3	52 0 24 3	25 4 34 4	19 1 20 0	31 9	" 3...	33 1 34 4	49 5 25 2	24 6 35 3			
July 3...	33 1 34 4	49 5 25 2	24 6 35 3	21 0 19 9	31 1	" 10...	33 4 34 2	50 1 25 10	24 9 37 2	19 4 20 0	31 6	" 17...	33 6 34 1	52 7 24 9	24 2 35 8			
" 17...	33 4 34 2	50 1 25 10	24 9 37 2	19 4 20 0	31 6	" 24...	33 10 34 0	53 10 24 1	24 7 35 10	20 8 19 9	32 1	" 31...	34 1 34 2	55 3 24 5	25 9 36 1			
" 31...	34 1 34 2	55 3 24 5	25 9 36 1	20 3 19 8	31 1	" 7...	34 1 34 9	55 4 24 9	25 2 35 7	19 0 19 1	31 5	" 14...	34 3 40 3	55 2 24 7	29 4 37 0			
Aug. 7...	34 1 34 9	55 4 24 9	25 2 35 7	19 0 19 1	31 5	" 21...	34 3 40 3	55 2 24 7	29 4 37 0	18 7 25 1	31 7	" 28...	34 7 38 9	54 3 26 5	29 10 39 4			
" 14...	34 3 40 3	55 2 24 7	29 4 37 0	18 7 25 1	31 7	" 28...	32 7 36 2	51 11 29 0	30 3 38 3	17 8 23 9	26 10	" 4...	31 11 36 5	45 3 30 11	30 6 38 1			
Sept. 4...	31 11 36 5	45 3 30 11	30 6 38 1	17 8 23 9	26 10	" 11...	31 9 37 10	43 0 31 5	29 11 37 11	18 0 23 11	26 8	" 18...	31 7 38 3	30 9 29 5	17 11 23 8			
" 18...	31 7 38 3	30 9 29 5	17 11 23 8	" 25...	31 6 37 6	30 1 29 3	17 9 23 3	" 9...	31 0 36 8	28 8 28 8	17 9 22 4	" 16...	30 11 36 7	28 8 28 8	17 9 22 4			
" 25...	31 6 37 6	30 1 29 3	17 9 23 3	" 9...	31 0 36 8	28 8 28 8	17 9 22 4	" 16...	30 11 36 7	28 8 28 8	17 9 22 4	" 23...	30 7 37 2	28 7 28 7	17 9 22 5			
Oct. 2...	31 3 37 1	29 1 29 3	17 9 23 3	" 9...	31 0 36 8	28 8 28 8	17 9 22 4	" 16...	30 11 36 7	28 8 28 8	17 9 22 4	" 23...	30 7 37 2	28 7 28 7	17 9 22 5			
" 9...	31 0 36 8	28 8 28 8	17 9 22 4	" 16...	30 11 36 7	28 8 28 8	17 9 22 4	" 23...	30 7 37 2	28 7 28 7	17 9 22 5	" 30...	30 1 37 10	28 2 28 3	17 9 23 7			
" 16...	30 11 36 7	28 8 28 8	17 9 22 4	" 23...	30 7 37 2	28 7 28 7	17 9 22 5	" 30...	30 1 37 10	28 2 28 3	17 9 23 7	" 6...	30 0 38 8	28 1 28 6	17 9 23 7			
" 23...	30 7 37 2	28 7 28 7	17 9 22 5	" 30...	30 1 37 10	28 2 28 3	17 9 23 7	" 6...	30 0 38 8	28 1 28 6	17 9 23 7	" 13...	30 1 39 8	27 8 29 0	17 11 24 8			
Nov. 6...	30 0 38 8	28 1 28 6	17 9 23 7	" 13...	30 1 39 8	27 8 29 0	17 11 24 8	" 20...	30 4 41 0	27 5 29 8	18 1 25 5	" 27...	30 9 41 11	27 0 30 3	18 4 25 8			
" 13...	30 1 39 8	27 8 29 0	17 11 24 8	" 20...	30 4 41 0	27 5 29 8	18 1 25 5	" 27...	30 9 41 11	27 0 30 3	18 4 25 8	" 4...	31 2 42 2	26 8 30 2	18 4 25 9			
" 20...	30 4 41 0	27 5 29 8	18 1 25 5	" 27...	30 9 41 11	27 0 30 3	18 4 25 8	" 4...	31 2 42 2	26 8 30 2	18 4 25 9	" 11...	31 2 42 1	26 5 29 11	18 6 25 9			
" 27...	30 9 41 11	27 0 30 3	18 4 25 8	" 4...	31 2 42 2	26 5 29 11	18 6 25 9	" 18...	31 2 42 7	25 11 29 8	18 5 25 9	" 25...	31 0 43 3	25 10 29 9	18 4 25 11			
Dec. 4...	31 2 42 2	26 8 30 2	18 4 25 9	" 11...	31 2 42 1	26 5 29 11	18 6 25 9	" 18...	31 2 42 7	25 11 29 8	18 5 25 9	" 25...	31 0 43 3	25 10 29 9	18 4 25 11			
" 11...	31 2 42 1	26 5 29 11	18 6 25 9	" 18...	31 2 42 7	25 11 29 8	18 5 25 9	" 25...	31 0 43 3	25 10 29 9	18 4 25 11							
" 18...	31 2 42 7	25 11 29 8	18 5 25 9	" 25...	31 0 43 3	25 10 29 9	18 4 25 11											
" 25...	31 0 43 3	25 10 29 9	18 4 25 11															

NOTE.—Returns of purchases by weight or weighed measure are converted to Imperial Bushels at the following rates: Wheat, 60 lb.; Barley, 50 lb.; Oats, 39 lb. per Imperial Bushel.

**AVERAGE PRICES of British Wheat, Barley, and Oats at certain Markets during the Month of August, 1914 and 1915.**

	WHEAT.		BARLEY.		OATS.	
	1914.	1915.	1914.	1915.	1914.	1915.
	<i>s. d.</i>	<i>s. d.</i>	<i>s. d.</i>	<i>s. d.</i>	<i>s. d.</i>	<i>s. d.</i>
London... ..	36 6	54 0	29 4	40 11	24 1	31 11
Norwich... ..	35 11	51 4	27 5	—	21 7	29 0
Peterborough... ..	37 2	52 4	28 3	37 7	21 10	31 0
Lincoln... ..	35 6	53 11	27 8	36 7	21 5	32 4
Doncaster... ..	36 4	53 7	—	35 9	21 8	31 10
Salisbury... ..	35 2	54 11	28 6	36 11	22 8	30 11

**SELECTED CONTENTS OF PERIODICALS.**

**Agriculture, General and Miscellaneous—**

- The Influence of Weather Conditions upon the Amounts of Nitric Acid and of Nitrous Acid in the Rainfall at and near Melbourne, *V. G. Anderson*. (Quart. Jour. Roy. Met. Soc., April, 1915.) [531.5.]
- Cultivation of Seaweed in Ireland, *G. H. Pethybridge*. (Dept. Agric. and Tech. Instr. Ireland Jour., April, 1915.) [63.195.]
- The Utilisation of Raw Mineral Phosphates as Manure. (Bull. Imperial Inst., Vol. XIII., No. 1, January-March, 1915.) [63.167.2.]
- Availability of the Nitrogen in Pacific Coast Kelps, *G. R. Stewart*. [63.165.]
- Organic Constituents of Pacific Coast Kelps, *D. R. Hoagland*. [63.165.] (Jour. Agric. Research [U.S.A.], Vol. IV, No. 1, April, 1915.)
- The Industrial Uses of Radium, *T. Thorne Baker*. (Jour. Roy. Soc. Arts, 16 April, 1915.) [63.168.]
- Agriculture in Hungary. (Estate Mag., June, 1915.) [63.1436.]

**Field Crops—**

- Sudan Grass or Garawa, *R. Hewison*. (Field, 24 April, 1915.) [63.33(4).]
- Investigations of Vegetable Drugs and Poisonous Plants. (Bull. Imperial Inst., Vol. XIII., No. 1, January-March, 1915.) [63.348; 63.25.]
- Sudan Grass, *J. A. T. Walters*. (Rhodesia Agric. Jour., April, 1915.) [63.33(4).]
- The Empire's Resources in Paper-making Materials, *S. Chas. Phillips*. (Jour. Roy. Soc. Arts, 21 May, 1915.) [676.]
- Notes on the Hydrocyanic-Acid Content of Sorghum, *J. J. Willaman and R. M. West*. (Jour. Agric. Research [U.S.A.], Vol. IV, No. 2, May, 1915.) [63.33(4).]
- Some Minor Farm Crops, II. I. Peppermint. II. Lavender. III. Poppies. IV. Celery. *G. H. Gressler and J. Stephenson*. (Jour. Roy. Agric. Soc. Eng., Vol. 75, 1914.) [63.511; 63.345; 63.348.]

**Horticulture—**

- Lawns and their Upkeep, *J. Macdonald*. [63.52.] A Guide to the Literature of Pomology, *E. J. Buryard*. [63.11(a); 61.] (Jour. Roy. Hort. Soc., Vol. XL., Part 3, April, 1915.)

**Plant Diseases—**

- Blister Disease of Fruit Trees, *G. Masser*. (Roy. Bot. Gard. Kew, Bull. Misc. Inform., No. 3, 1915.) [63.24-41.]











